BLUE JAY

September 1990

The Blue Jay, founded in 1942 by Isabel M. Priestly, is a journal of natural history and conservation for Saskatchewan and adjacent regions. It is published quarterly by the Saskatchewan Natural History Society, Box 4348, Regina, Saskatchewan. S4P 3W6. CN ISSN 0006-5099.

EDITORIAL INFORMATION: All items for publication should be addressed to the editor at **Box 550, Raymore, Saskatchewan. S0A 3J0** Deadlines for each issue are 2 months prior to issue, i.e. 1 January, 1 April, 1 July and 1 October. Typewritten manuscripts should be double spaced and submitted in duplicate. Manuscripts may be submitted in text file form on IBM compatible 5.25 inch DSDD diskettes, or 3.5 inch (either in high or low density) which will be returned to authors when copies have been made. Please include a hard copy. For further guidelines contact the editor. Common names are used for species where possible. Bird names follow the 1983 revision of the American Ornithologists' Union Check-list. Mammals are from Banfield's The Mammals of Canada (1974). Since insect and plant names are not standardised, scientific names are included, with authorities where deemed necessary. Scientific names are also included for extralimital species, those not normally occurring in North America.
Photographs submitted should be on glossy paper. Negatives or slides sent will be returned after prints have been made for SNHS files. Prints will be returned on request. Deadlines for photographic materials are 4 weeks prior to issue, i.e. 1 February, 1 May, 1 August and 1 November.
Any material printed for the first time in the Blue Jay may be reproduced without permission. Credit lines will be appreciated. Use of photographs requires written permission from the photographer.

ADVERTISING: Advertising rates may be obtained from SNHS, Box 4348, Regina, Saskatchewan. S4P 3W6

REPRINTS: Requests for quantities of reprints of any article in the Blue Jay should be made to the editor with the submission of an article. Contributors wishing a few extra copies of the current issue may get them at cost. Requests for these should be made to the editor when material is submitted for publication.

SUBSCRIPTION-MEMBERSHIPS: Send all renewals, new memberships, and correspondence concerning changes of address to **SNHS, Box 4348 Regina, Saskatchewan. S4P 3W6**
The classes of membership in the Society are as follows: Regular $12.; Sustaining $25.; Patron $50.; Junior $8. and Senior Citizen $10. Sustaining and Patron memberships include the regular fee plus a donation for which a receipt is available, upon request, for income tax purposes. Bulk orders (minimum of 5 to one address) are available to club members and educational institutions at the rate of $12. for the first subscription and $10. for each additional one. Life memberships are $500. Outside Canada fees are $15.

Cover: *Piping Plover. Cavendish Sandspit, P.E.I. Winifred Wake*

MEMBERSHIP RENEWAL AND GIFT FORM

Name (please print) . . . . . .
Address . . . . . .
. . . . . .
City/Town . . . . . Prov. . . . . Postal Code . . . . . .

Type of Membership (please check)

Regular -- Canada ($12) . . . . . [] Regular -- outside Canada ($15) . . . . []
Junior -- Canada ($8) . . . . . [] Senior Citizen -- Canada ($10) . . . . []
Sustaining ($25) . . . . . [] An income tax receipt for Sustaining,
Patron ($50) . . . . . [] Patron, Life Memberships and Donations
Life ($500) . . . . . [] will be sent if you check here . . . . . []

I am a new member for 199_____ This is a renewal for 199_____

I wish to make a donation to: Conservation Fund $ . . . . . []
Heritage Marshes Fund $ . . . . . []
. . . . . Other $ . . . . . []
Check above if receipt is required.

* **Life Membership** is payable at one time or over 5 years, or any shorter period agreed.

* Any amount over $10.00 in excess of the regular membership of $12.00 is viewed as a **donation** for income tax purposes and a receipt for the excess amount will be mailed if the appropriate box is checked above.

* **Bulk subscriptions** to schools and clubs is $12.00 for the first subscription and $10.00 for each additional subscription to the same address (minimum of 5 subscriptions).

Please send **Blue Jay Gift Subscription** to:

Name . . . . . .
Address . . . . . .
City/Town . . . . . Prov. . . . . Postal Code . . . . . .
[] Check here if you wish us to send a card announcing the gift.

Type of Gift Membership (Please check)

Regular -- Canada ($12) . . . . . [] Junior -- Canada ($8) . . . . . []
Regular -- outside Canada ($15) . . [] Senior Citizen -- Canada ($10) . . . . []

* Send renewal form to **SNHS**
Box 4348
Regina, Saskatchewan
S4P 3W6

Make cheques and money orders payable to **Saskatchewan Natural History Society**

* Do you know of any person interested in natural history and conservation who does not receive the *Blue Jay*? Please send their name and address and we will send a sample *Blue Jay* and an invitation to join our Society.

THIS ORGANIZATION RECEIVES FUNDING FROM

Saskatchewan
LOTTERIES

BLUE JAY

Vol. 48 No. 3 September 1990 125-170

SASKATCHEWAN BIRD BANDERS
R. LORNE SCOTT*

C. STUART HOUSTON and MARY I. HOUSTON, 863 University Drive, Saskatoon, Saskatchewan. S7N 0J8

Lorne Scott received banding permit #10242 in 1969, and since then has banded 24,559 individual birds of 43 species in 21 years. Over half of his banding, 11,656 Tree Swallows and 6,339 Mountain Bluebirds, has resulted from the 2000 bird houses he has built around Indian Head and on his portion of the Prairie Bluebird Trail, between Raymore and Broadview. His peak year for Mountain Bluebirds was 1974 when he banded 900. His peak year for Tree Swallows was

* Number 15 in a series of biographies of Saskatchewan bird banders

1975 when he banded 2299 of his year's grand total of exactly 4000 birds. He has also banded 50 Eastern Bluebirds, including 15 in 1973. From 1969 through 1975, in between seeding and haying seasons, Lorne was accompanied by Gary Seib in dawn-to-dark "blitzes" of 2000 houses along over 500 miles of highways and backroads, stopping about three times each mile. The overall trail extends from Denholm, Saskatchewan to Winnipeg, Manitoba and to the best of our knowledge is the longest trail, in terms of distance between extremities, of any such trail in the world.

Lorne has banded a substantial number of waterfowl at the Wascana Centre in Regina, including 1407 Canada Geese, 2217 Mallards, 111 Blue-winged Teal and 121 Lesser Scaup. The only colonial birds banded are Common Terns, with 180 banded on an island in Wascana Lake, but he has banded 875 Yellow-headed Blackbirds nesting in bulrushes at Wascana Marsh. He banded 3 immature Piping Plovers at Chaplin Marsh in 1987.

A time-consuming activity has involved the banding of 379 Great Horned Owl, 210 Burrowing Owl, 191 Red-tailed Hawk and 29 Swainson's Hawk nestlings, plus 301 nestling Black-billed Magpies. Lorne's peak year for Red-tailed Hawks was 1969 with 86 nestlings banded, for Great Horned Owls, 1970 with 99 nestlings banded, and for Burrowing Owls, 1988 with 82 banded.

Lorne has had 441 recoveries to date, not counting "returns" of bluebirds and tree swallows to nest boxes in subsequent years. The list of recoveries is led by 227 Canada Geese and 167 Mallards, followed by three each of Green-winged Teal and Black-billed Magpie, two each of Blue-winged Teal and Common Tern, and one each of Lesser Scaup, Swainson's Hawk, Cedar Waxwing and Yellow-headed Blackbird.

Common Terns travelled to Ponta de Mita, Nayarit, Mexico by 5 January and to Puerto San Jose, Guatemala, by 10 January, just over six months after each was banded.

Since large numbers of Canada Geese wintered on Wascana Lake when the power plant maintained open water and a somewhat smaller number still winter in the snow, the southward travels of the Wascana geese seem all the more remarkable. Lorne has had 75 goose recoveries from Nebraska, 47 from South Dakota, 15 from Kansas and 9 from Colorado, plus two each from Alberta, Minnesota, North Dakota, Texas and Wyoming and one each from Kentucky, Missouri and Oklahoma. Of interest are the geese whose bands were read from a distance by telescope: one each in Kansas, Minnesota and South Dakota, and one whose band was read twice in Nebraska in the same winter. Two geese were trapped in Nebraska during operations by a state banding crew, and four were retrapped during later banding operations on the Wascana Marsh at Regina.

Mallards from the Regina Waterfowl Park have dispersed even more widely, with recoveries in decreasing frequency from Arkansas (24), Louisiana (14), Nebraska (13), Kansas (9), Mississippi (9), North Dakota (7), Iowa (6), Missouri (6), Oklahoma (4), Kentucky (3). Two each went to Alberta, Manitoba, Colorado, Idaho and Tennessee, and one each to Nevada (!), South Dakota, Texas, and Wisconsin. A Lesser Scaup and a Blue-winged Teal were shot in Louisiana, another Blue-winged Teal in Iowa, and Green-winged Teal in Louisiana, Texas and Sinaloa, Mexico.

Among 22 Great Horned Owl and 7 Red-tailed Hawk recoveries are two remarkable longevity records. A Great Horned Owl, 518-60849, banded near Maryfield, 49° 40' North, 101° 20'West,

on 17 May 1970 was found weak and soon died in Mrs. Tom Naylen's yard at 49° 30'North, 101° 50'West (near Redvers in southeastern Saskatchewan), in October 1988. This is one of the six oldest owls in the North American banding recovery files at last report. A Red-tailed Hawk, 697-55321, banded north of Balcarres on 28 June 1969 was found dead on a highway 9 miles south of Quinton, Saskatchewan, on 2 September 1989. It was 20 years, 2 months old. Until 1983 the Redtail record had been 19 years, 9 months, but then an Iowa-banded hawk was recovered in the same state when at least 21 years, 6 months old.

The greatest distances travelled by owls were to Iowa: one banded south of Lebret was recovered that November at Pickerel Lake, Iowa, and one banded 7 miles west of Duval was found dead the next May in Calhoun County, Iowa. Other owls went to Manitoba, North Dakota and South Dakota. Redtails banded near Gibbs were found injured at Altoona, Kansas, shot at Fredonia, Kansas, and found dead west of Fort Dodge, Iowa, the following winter. Another Redtail from Neudorf was found dead near Enid, Oklahoma, 18 months later.

Three Black-billed Magpie recoveries have been near the place of banding. A Yellow-headed Blackbird was shot at Fresnillo, Zacatecas, Mexico within two months after it was banded. A nestling Cedar Waxwing, banded south of Indian Head on 10 July 1977, was caught by a cat at Atikokan, Ontario, 885 km to the east, on 28 August of the same year.

Extensive banding of bluebirds and tree swallows has failed to provide recoveries from the wintering grounds of these two species, but a Tree Swallow was found dead in fall migration in North Dakota and another was recovered from Minnesota. One Mountain Bluebird was found dead in North Dakota during spring migration of the year following banding.

Lorne grew up on the family farm southeast of Indian Head, attended a one-room country school, and graduated from the Indian Head high school in 1966. He worked at the Saskatchewan Museum of Natural History from 1 May 1967 through November 1975, guiding tours, working on children's programs, setting up the first nature trails in several provincial parks, and doing research and display work. Lorne next accepted a position as the first full-time Park Naturalist for Wascana Centre Authority in Regina, where he remains employed, commuting each day from his 800-acre farm. Here he maintains 200 acres of poplar copses (called "bluffs" in Saskatchewan) and sloughs as formally protected wildlife habitat under the SWF's "Acres for Wildlife" program, providing food and shelter for many bird and mammal species.

Lorne has received many prestigious awards, including:

Annual Conservation Award of the Saskatchewan Natural History Society (1969); Honorary Life Membership in Whooping Crane Conservation Association (1974); Canadian Merit Award as an outstanding young citizen (1978); Gordon Lund Memorial Conservation Award from Saskatchewan Wildlife Federation (SWF) (1981); First recipient of the Governor General's Conservation Award sponsored by the Tourism Industry Association of Canada (1980); Conservation Service Award from Ducks Unlimited Canada (1982); John and Norah Lane Conservation Award from the North American Bluebird Society (1983); B.M. Melanson Award from the Saskatchewan Outdoor and Environmental Education Association (1987); Honour Award from Whooping Crane Conservation Association (1987); Roland Michener Conservation Award from Canadian Wildlife Federation (1989); Douglas Pimlott Award from Canadian Nature Federation (1990).

Lorne was a member of the board of the Saskatchewan Natural History Society, 1968-1979, first as Youth Program Director, then President of the SNHS, 1980-82, launching money-raising for the SNHS Conservation Fund and in participation with the SWF, launching the Heritage Marsh Program, 5 November 1981. He served on the Board of Directors of the North American Bluebird Society, 1980-1981. He became active with the Saskatchewan Wildlife Federation, serving as their Provincial Habitat Chairman, 1982-1985 and 1988-89 and as its President, 1986-1987, the only person ever to be president of both the provincial naturalists' and sportsmens' organization in Saskatchewan. He was President of the Whooping Crane Conservation Association, as well as coordinator of the WCCA Canadian Council since it was formed in 1972. He was director of the Canadian Nature Federtion, 1985-1986, director of the Canadian Wildlife Federation, 1986-89 and on the World Wildlife Fund's Wild West Steering Committee which focussed on Prairie Endangered Species, 1986-88.

From 1972 through 1976 Lorne was contributing editor to the monthly *Purple Martin News*, published in Griggsville, Illinois. He has contributed articles to *Blue Jay* and *Beaver*, written for the Canadian Wildlife Service's *Hinterlands Who's Who*, and contributed photographs to *Blue Jay, Defenders of Wildlife, National Geographic*, and *Nature Canada*. He has been interviewed on "Canada A.M.", and has spoken to naturalists groups in Saskatchewan, Alberta and Manitoba and to the annual banquets of the North American Bluebird Society and Ducks Unlimited (Canada). Bird banding has been only one facet of the activities of this farmer-naturalist.

Lorne Scott leading a nature tour at Condie Nature Reserve *Gary W. Seib*

INVASION OF THE CANADIAN PRAIRIES BY AN EXOTIC PERENNIAL

J.T. ROMO and P.L. GRILZ, Department of Crop Science and Plant Ecology, University of Saskatchewan, Saskatoon, Saskatchewan, S7N 0W0 and E.A. DRIVER, Canadian Wildlife Service, 115 Perimeter Road, Saskatoon, Saskatchewan. S7N 0X4

Introduction

Since settlement of the Canadian Prairies the grasslands have been influenced by a variety of agricultural practices.[18] These practices and their impact, such as tillage and growing annual crops, have completely obliterated the grasslands. Another activity that has generated much interest and has modified the prairie is imprudent grazing management. While these activities have drawn considerable attention from conservationists, an equally important event which has received less attention has been the purposeful introduction of exotic plants such as Alfalfa (*Medicago sativa*), Crested Wheatgrass (*Agrogypron cristatum*), Russian Wild Rye (*Psathyrostachys juncea*) and Smooth Brome (*Bromus inermis*) into the prairie ecosystem, primarily for the purpose of forage production.

To the uninformed or unconcerned the introduction of exotic species into the ecological integrity of the prairie ecosys-

Old school north of Maryfield, Saskatchewan. Abandoned building sites often are vegetated with Smooth Brome, which moves outwards from these sites.

B. de Vries

tems is viewed as harmless unless they pose a threat to crops. However, to conservationists these introductions should signal the potential for further destruction of native flora and, they also signal an unknown threat to the ecosystem. Unfortunately many students of the natural prairie have been concerned with the larger and more obvious issues, cultivation and grazing, not to grassland disappearance because of seeding and the fugitive expansion of exotic species.

How long and in what ways these exotic plants express their potential and impact on the ecosystem over their new range is not elucidated by short-term evaluations. Their dispersal, establishment, and domination of native flora can be an insidious process that for all practical purposes permanently transforms native vegetation into plant communities dominated by exotics. In particular, many vegetation complexes are becoming dominated by Smooth Brome.

The introduction and use of Smooth Brome

The exact date when Smooth Brome was introduced to Canada is not known, but it appeared sometime between 1875 and 1888.[1,5] Immigrants from Europe may have brought some of the grass with them for which there will be no record. Regardless of the date of introduction and its origin, by 1896 scientists with the Dominion Department of Agriculture recognized Smooth Brome as a useful grass for revegetating native grasslands that had become "exhausted;" by 1930 its superior adaptability and performance was recognized.[7] It became widely used for hay and pasture, frequently escaping cultivation to form a common grass cover on roadsides, railway rights-of-way, abandoned lands, and other disturbed areas.[10] Since its introduction in the late 1800s Smooth Brome has been widely distributed throughout Canada.

This long-lived perennial is adapted to a variety of soils, growing best on those that are fertile and well-drained.[16] Smooth Brome is valued for grazing and hay and it is the most important introduced forage in the central and northern parts of the Prairie Provinces.[11] This distribution corresponds with the Aspen Parkland and the southern edge of the Boreal Forest. In the Mixed Prairie Smooth Brome is best adapted to sites that are cooler and moister than the general environment. It is also grown under irrigation.

Ecological relations of Smooth Brome with native flora and fauna

Once Smooth Brome establishes, it effectively suppresses the growth of other species. Research on a protected Fescue Prairie in Saskatchewan identified that the richness of native species declined to a point where native species were almost non-existent on sites where Smooth Brome had invaded (Grilz, unpubl. data). Where exotic species were dominant in Mixed Prairie in Manitoba, the cover and diversity of native species was reduced.[22] Wilson concluded that introduced species can competitively exclude native grasses, with Smooth Brome being one of the most dominating introductions.[23] Looman also noted a decline in floristic composition on sites where Smooth Brome had invaded.[11]

Not only is this demise and domination of native species occurring, but the adulteration of native germplasm is also a concern. There is evidence that Smooth Brome is crossing and intergrading with Northern Awnless Brome (*Bromus pumpellianus*), a native perennial (V. Harms, pers. comm.). What long-term impact this will have is unknown.

Associated with the increases in Smooth Brome in native prairie is a decline in use of the grassland by many species of wildlife (Driver, unpubl. data). At Last Mountain Lake Wildlife Refuge Driver found that as the age of Smooth

Brome-dominated grasslands increased the use by birds declined from eight to ten species to primarily two species — Savannah Sparrow and Clay-colored Sparrow. Wilson and Belcher concluded that exotic vegetation influences bird communities by causing a change in the species composition with some bird species increasing while others decline.[7]

Dispersal Ecology of Smooth Brome

The most obvious threat by Smooth Brome to native grassland ecosystems is the cultivation and seeding of this exotic on prairie that has been degraded by improper grazing. Other threats are subtle, but perhaps more important is the spatial distribution of this species.

In the early evaluations of this grass, Fletcher stated that Smooth Brome had one disadvantage — "a habit of growing like quackgrass" (presumably *Agropyron repens*).[3] We can only speculate exactly what was meant by this statement, but it is assumed he meant that Smooth Brome possessed an aggressive and spreading habit. Smooth Brome is one of the best grasses for erosion control, thus it is often seeded on sites disturbed in road construction, and oil, gas and mineral development.[11] These many seedings act as small foci that can collectively occupy nearby areas faster than one large introduction such as seeded pastures.[5, 10] Hume and Archibold's data show that seeds of Smooth Brome were transported at least 7 m from the edges of seeded pastures.[5] Provided a suitable habitat is present in adjacent vegetation, many sites are subject to invasion because of prolific seed production. Once established Smooth Brome spreads rapidly by rhizomes and seeds. Thus, the well-intentioned effort of stabilizing sites by revegetating them with Smooth Brome is actually accelerating the spread of this species.

The major issue that must be reckoned with is the planting of Smooth Brome in the vicinity of grasslands that are susceptible to invasion. How it moves into and through the prairie does not appear related to a specific vector, but rather to a host of dispersal mechanisms.

Looman concluded that Smooth Brome does well in the Fescue grassland of Canada, invading sites that are grazed or otherwise disturbed.[11] However, Fescue Prairie which is protected form grazing by domestic livestock is not exempt from invasion by Smooth Brome. Data from a relict Fescue Prairie near Saskatoon shows that Smooth Brome was the fifth most common of 16 graminoids. Similarly, Blood reported that Smooth Brome was the fifth highest producing graminoid in Fescue Prairie in Riding Mountain National Park.[2] In relative terms both of these tracts of Fescue Prairie were undisturbed. We have also observed brome invading many relict areas of Fescue Prairie.

The grasslands of the Mixed Prairie region in southern portions of the Prairie Provinces appear resistant to invasion by Smooth Brome. However sites with better soil and moisture conditions, including riparian zones and wooded draws, are being invaded by brome.

Native grasslands that are protected are viewed by many naturalists as being undisturbed, however, this attitude is tempered by the definition of disturbance and its scale. Large accumulations of dead plant material tend to reduce the vigour and density of the grasses, creating sites amenable to establishment of other species. Ways of preventing this accumulation include its removal by grazing or mowing and the use of prescribed burning.[4] Hulbert concluded that where fire is used regularly Smooth Brome is rare in native grassland except where native grasses have been weakened or are absent following disturbance.[6]

Protected native grasslands may also harbour high populations of mammals and their activities such as burrowing and

herbivory can create significant disturbance on a localized scale that is not obvious. Larger disturbances are also caused by burrowing animals such as Red Fox and Badger. We have observed Thirteen-lined Ground Squirrels caching inflorescences of Smooth Brome near their burrows. This caching, combined with the disturbance of burrowing creates a potential site for establishment.

We have a poor understanding of the importance of this species in the diets of birds. For a similar species, Cheatgrass Brome (*Bromus tectorum*), a small percentage of the seeds ingested can pass unharmed through the digestive tract of birds.[19] Perhaps another important means of dispersal is the fact that often this grass is hayed after seeds have been formed. When this hay is consumed by domestic livestock and native ungulates some seeds may pass through the digestive tract in a germinable condition and be dispersed over the landscape.

Smooth Brome has a prolonged period of seed dispersal, with seeds being dispersed from maturation in mid-summer throughout the winter (V. Harms, W.P. Fraser Herbarium, University of Saskatchewan). Since seedheads are often elevated above the snow, seeds may be blown from established plants across snow pack, lodging at other sites in the snow. It is a matter of chance as to whether the site of seed deposition provides a suitable safe site for its germination and establishment.

Smooth Brome is often planted along streams because of the high potential for forage production on these sites. Since seeds and seedlings of Smooth Brome can also tolerate prolonged periods of flooding the seeds can be transported downstream and deposited over a wide area.[14] The movement of seeds by water in these situations is extremely important in its long distance dispersal along riparian zones, although the other transport mechanisms are probably also operating.

Why is Smooth Brome successful?

This question can not be answered with certainty, but from a theoretical standpoint the following arguments can be put forth. This grass has been selected by forage breeders for superior establishment, growth, persistence, and prolific seed production over a wide range of conditions. The germination and the growth of seedlings are also far superior to many native species.[20] When established brome forms a dense root system in the upper soil profile.[13] The purposeful selection for the prevailing environmental conditions of the Canadian Prairies and natural selection processes have produced an extremely well-adapted species that has become naturalized. These characteristics, combined with the fact that there are few if any natural predators, are enabling the grass to spread unchecked.

What does the future hold?

Through the history of settlement on the Canadian Prairies there has been an attitude of attempting to remedy the symptoms of poor land management rather than addressing the cause(s). One of these ill-founded solutions has been the introduction of exotic plants. Smooth Brome was examined as a potential forage because production of native grasses was apparently declining.[7] Little or no attempt was made to determine why it was declining. This attitude was, and still is, bolstered by the thought that technology or new technologies will permanently solve resource management problems.[3]

Conservationists have the opportunity to learn from the mistakes made by treating symptoms of poor resource management rather than identifying and treating the cause of the problems. The invasion and domination by Smooth Brome of natural ecosystems, a serious resource management problem, must be ad-

dressed and solved before the natural heritage of the Canadian Prairies is lost. This issue will continue to worsen because of natural selection pressures and the release of new and improved varieties.

Today we do not know for certain what the longterm consequences of introducing Smooth Brome might be. Only time will elucidate the implications of introducing this species to native plant communities. However, by examining the impacts of this plant on a local scale we feel confident of some predictions.

It is our opinion that a passive or hands-off approach to managing natural areas will eventually result in invasion by this exotic. Vegetation types that appear most prone to invasion by Smooth Brome are Boreal Forest, Aspen Parkland, Fescue Prairie and specialized habitats occupied by woody species in the Mixed Prairie. These vegetation types provide habitats that are similar to the "steppe meadows," shrubbery and openings that Smooth Brome occupies in Eurasia.[12] Conservation management plans must be developed that place managers in a proactive position rather than one in which they react to invasions. The consequences of invasions by Smooth Brome will become more severe the longer the development of plans is delayed.

Conclusions

The future of many native plant communities on the Canadian Prairies is bleak because of the combined influence of ploughing native grasslands and the introduction of Smooth Brome. As more land comes under cultivation and the native grasslands become more fragmented, the ratio of the disturbed land to undisturbed prairie increases. This increase in the relative amount of disturbed land will accelerate the rate of spread of exotic species.

Conservationists are now faced with an enormous task if they wish to preserve the integrity of native flora. Our native grassland ecosystems are threatened by a land use philosophy and a species that was introduced without considering the long-term impact on the ecosystem. Should we accept Smooth Brome as part of the native flora and let this species run its natural course? How much and where is this species acceptable? These questions can be answered only after landscape management goals are established.

We should prevent invasions and where invasions have already occurred, the species must be controlled in the earliest stages of development. In other words, strategies should be developed to protect the unaffected or least affected grasslands first. Until this is completed we must direct our management activities toward eliminating satellite populations. This will require that we expand our understanding of ecological relationships of Smooth Brome in native communities.

[1] BEST, K., J. LOOMAN and J.B. CAMPBELL. 1971. Prairie grasses identified and described by vegetative characters. Agric. Canada Publ. 1413. Ottawa.

[2] BLOOD, D.A. 1966. The *Festuca scabrella* Association in Riding Mountain National Park, Manitoba. *Can. Field-Natur.* 80:24-32.

[3] CROSSON, P.R. and N.J. ROSENBERG. 1989 Strategies for agriculture. *Scientific Amer.* 261:128-135.

[4] DRIVER, E.A. 1987 Fire on grasslands — friend or foe? *Blue Jay* 45:217-225.

[5] FLETCHER, J. 1893 A valuable European grass. Canada House of Commons Report of the Select Standing Committee on agriculture and colonization. p 32.

[6] HARPER, J.L. 1977. Population biology of plants. Academic Press, N.Y.

[7] HEINRICHS, D.H. 1969. Forage crops research, past, present and future. *In* NIELSON, K.F., Ed. Proc. of the Canadian Forage Crops Symposium. pp 53-67. Modern Press, Saskatoon.

[8] HULBERT, L.C. 1986. Fire effects on tallgrass prairie. *In* CLAMBEY, G.K. and R.H. PEMBLE, Eds. Proc. of the ninth North American prairie conference. pp 138-142. Tri-college University Center for Environmental Studies, North Dakota State Univ., Fargo.

[9] HUME,L. and W. ARCHIBOLD. 1986. The influence of weedy plant habitat on the seed bank of an adjacent cultivated field. *Can.J. Bot.* 64:1879-1883.

[10] KNOWLES, R.P. and W.J. WHITE. 1949. The performance of southern strains of brome grass in western Canada. *Sci. Agric.* 29:437-450.

[11] LOOMAN, J. 1969. The fescue grasslands of western Canada. *Vegetatio* 19:128-145.

[12] LOOMAN, J. 1983. Productivity of permanent bromegrass pastures in the parklands of the Prairie Provinces. *Can. J. Plant Sci.* 56:829-835.

[13] LOOMAN,J. 1983. 111 range and forage plants of the Canadian prairies. Agric. Canada Publ. 1751. Ottawa.

[14] McKENZIE, R.E. 1951. The ability of forage plants to survive early spring flooding. *Sci. Agric.* 31:358-367.

[15] MOODY, M.E. and R.N. MACK. 1988. Controlling the spread of plant invasions: the importance of nascent foci. *J. Appl. Ecology* 25:1009-1021.

[16] NEWELL, L.C. 1973. Smooth bromegrass. *In* Forages: the science of grassland agriculture. pp 254-262. Iowa State Univ. Press, Ames.

[17] PYLYPEC, B. 1986. The Kernen Prairie — a relict fescue grassland near Saskatoon, Saskatchewan. *Blue Jay* 44:222-231.

[18] ROWE, J.S. 1987. One hundred years of land use. *Blue Jay* 45:127-139.

[19] SAVAGE, D.E., J.A. YOUNG and R.A. EVANS. 1969 Utilization of medusahead and downy brome caryopses by chukar partridges. *J. Wildl. Mgmt.* 33:975-978.

[20] SMOLIAK, S. and A. JOHNSTON. 1968. Germination and early root growth of grasses at four root-zone temperatures. *Can. J. Plant Sci.* 48:119-127.

[21] WALTON, P.D. 1983. Production and management of cultivated forages. Reston Publ. Reston, Virginia.

[22] WILSON, S.D. and J.W. BELCHER. 1989. Plant and bird communities of native prairie and introduced Eurasian vegetation in Manitoba, Canada. *Cons. Biol.* 3:39-44.

[23] WILSON, S.D. 1989. The suppression of native prairie by alien species introduced for revegetation. *Landscape Urban Plann.* 17:113-119.

EDITOR'S NOTE:

The problem with Smooth Brome is that its natural insect, nematode, and fungous pests haven't come over with it from Europe. And this raises a taxonomic question in my mind: If *Bromus inermis* is akin enough to *B. pumpellianus* to cross with it, why can't the parasites and predators which *B. pumpellianus*, as a native species, undoubtedly bears as a burden, attack *B. inermis*? I haven't observed any such disease or insect attack in nature; therefore my guess is that the two species are distinct, contrary to the views given by some authors. — *J.H. Hudson*

CHECK-LIST OF SASKATCHEWAN MOTHS

PART 6: LOOPER MOTHS (PLUSIINAE)

RONALD HOOPER, Box 757 Fort Qu'Appelle, Saskatchewan. S0G 2P0

The caterpillars of this sub-family are called loopers because they loop their backs similar to Geometrid Moths when they are crawling because they lack legs on the third and fourth abdominal segments.

The adults are medium sized moths. The fore-wings are grey or brown and often there is a silver mark in the middle. Sometimes this mark is shaped like an "o" or a "u" or a "y," causing the name "*Autographa*" to be given to one of the genera. The hind wings are usually pale brown, buff, or orange, with broad dark bands near the outer margin.

Many of the species are avid flower feeders in the daytime. Some of the forest species prefer aster blossoms.

Abbreviations used in the text for directions are s = south, n = north, w = west, e = east; CNC = the only known Saskatchewan records of this species are in the Canadian National Collection in Ottawa. (All species are represented in the Saskatchewan Museum of Natural History collection in Regina unless otherwise stated).

Variegated Brindle - *Abrostola urentis* Gn. - s Saskatchewan, n to Aylsham.

Cabbage Looper - *Trichoplusia ni* (Hbn.) - s Saskatchewan, n to Aylsham.

Brassy Plusia - *Diachrysia aeroides* (Grt.) - s Saskatchewan, n to Red Earth, Aylsham, and Anglin Lake.

Large Brassy Plusia - *D. balluca* Gey. - Bjorkdale, Tantallon, Indian Head and Regina.

Unspotted Looper Moth - *Allagrapha aerea* (Hbn.) - Reported for Chaplin area by Eichlin and Cunningham.

Straight-lined Looper Moth - *Pseudeva purpurigera* (Wlk.) - s Saskatchewan, n to Somme.

European Looper - *Polychrysia moneta trabea* (Sm.) - Regina; also reported for the Meadow Lake area by Eichlin and Cunningham.

Formosa Looper Moth - *Chrysanympha formosa* (Grt.) - Little Bear Lake, Jay Jay Lake (near Big Sandy Lake), La Ronge, Otter Rapids and Gordon Lake (near Pinehouse).

Pink-tinted Beauty - *Eosphoropteryx thyatyroides* (Gn.) - Fort Qu'Appelle and Aylsham.

Bilobed Looper Moth - *Autographa biloba* (Steph.) - Bjorkdale and Saskatoon.

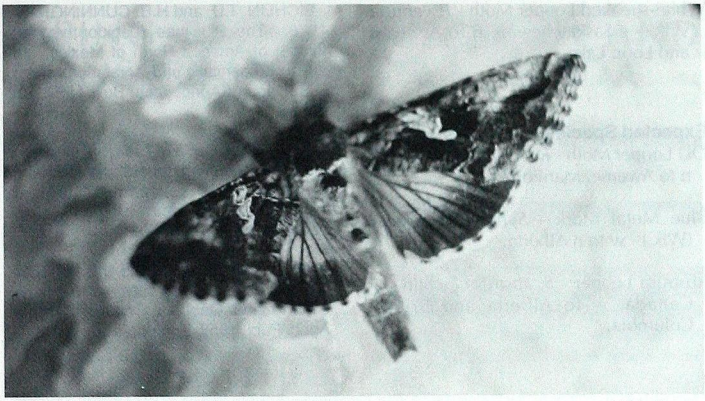
Common Looper Moth - *A. precationis* (Gn.) - Earl Grey

Rubida Looper Moth - *A. rubida* Ottol. - Cypress Hills and Saskatoon.

Twin Gold Spot - *A. bimaculata* (Steph.) - s Saskatchewan, n to La Ronge.

Wavy Chestnut Y - *A. mappa* (G. and R.) - Kamsack, Somme, Aylsham, and Candle Lake.

Delicate Silver Y - *A. pseudogamma* (Grt.) - Cypress Hills (CNC).



Alfalfa Looper *K.N. Roney*

Alfalfa Looper - *A. californica* (Spey.) - Throughout Saskatchewan, except northeast corner.

Silver Whip - *A. flagellum* (Wlk.) - Norquay, Somme, Shoal Lake, Aylsham and Saskatoon.

Broken-banded Y - *A. ampla* (Wlk.) - s Saskatchewan, n to Aylsham.

Celery Looper - *Anagrapha falcifera* (Kby.) - s Saskatchewan, n to Aylsham and Meadow Lake Park.

Dusky Silver Y - *Syngrapha octoscripta* (Grt.) - n Saskatchewan, s to Mortlach.

Narrow Silver Y - *S. epigaea* (Grt.) - Shoal Lake and Saskatoon.

Green-marked Looper - *S. viridisigma* (Grt.) - Throughout Saskatchewan.

Diasema Looper - *S. diasema* (Bdv.) - La Loche.

Silver U Looper - *S. u-aureum* (Gn.) - Montreal Lake area and Athabasca Sands area (reported by Eichlin and Cunningham).

Question Mark Looper - *S. interrogationis* (L.) - Black Lake, Umpherville River (near Wollaston Lake) and Key Lake.

Surena Looper - *S. surena* (Grt.) - Midwest Lake (west of Wollaston Lake).

Hooked Silver Y - *S. alias* (Ottol.) - n Saskatchewan, s to Saskatoon.

Mountain Looper - *S. montana* (Pack.) - Harlan (CNC).

Small Gamma Looper - *S. microgamma* (Hbn.) - Weekes.

Alticola Looper - *S. devergens alticola* (Wlk.) - reported for Cluff Lake area by Eichlin and Cunningham.

Mountain Beauty - *S. ignea* (Grt.) - Cypress Hills, Porcupine Hills, Aylsham and Hunt Falls.

Putnam's Looper Moth - *Plusia putnami* Grt. - s Saskatchewan, n to Aylsham and Buffalo Narrows.

Connected Looper Moth - *P. contexta* Grt. - Fort Qu'Appelle and Saskatoon.

White-streaked Looper Moth - *P. venusta* Wlk. - s Saskatchewan, n to Aylsham and Loon Lake.

Expected Species

OU Looper Moth - *Rachiplusia ou* (Gn.) - n to Aweme, Manitoba.

Blue Metal Mark - *Syngrapha selecta* (Wlk.) - w to n Alberta.

Abstrusa Looper - *S. abstrusa* Eichlin - e Canada, w to Alberta and British Columbia.

1 EICHLIN, T.D. and H.B. CUNNINGHAM. 1978. The Plusiinae (Lepidoptera:Noctuidae) of America North of Mexico, emphasizing genitalic and larval morphology. U.S. Dept. of Agric. Tech. Bull. 1567. 122 pp.

2 McDUNNOUGH, J. 1944. Revision of the North American genera and species of the Phalaenis subfamily Plusiinae (Lepidoptera). Memoirs of the S. Calif. Acad. of Sci. 2(2):175-232.

3 ROCKBURNE, E.W. and J.D. LAFONTAINE. 1976. The cutworm moths of Ontario and Quebec. Canada Dept. of Agric. Publ. 1953. 164 pp.

CHRISTMAS BIRD AND MAMMAL COUNTS - ANNOUNCEMENT

Count period this year is from **Saturday, 15 December 1990** to **Wednesday, 2 January 1991**. Count area should be a circle 24 km (15 mi.) in diameter. Counts must be a minimum of 3 hours in duration. Count forms will be mailed to compilers who submitted counts in 1989. Anyone else wishing to send in a count please write for forms to:

Wayne C. Harris
Box 414
Raymore, Saskatchewan
S0A 3J0

Reports of counts should be sent to Wayne as soon as possible after they are taken. To be included inthe report in the March 1991 *Blue Jay* they must reach Wayne by **12 January 1991**.

PIPING PLOVER RESEARCH AND CONSERVATION IN CANADA

J. PAUL GOOSSEN, Canadian Wildlife Service, Room 210, 4999 - 98 Avenue, Edmonton, Alberta. T6B 2X3

The Piping Plover is a small North American shorebird which received relatively little attention from researchers until the 1980s when concern was expressed that this species had suffered a serious population decline.[11] In 1985, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) declared the Piping Plover to be an endangered species based on a status report recommendation,[12] while the United States Fish and Wildlife Service (USFWS) declared the plover to be endangered in the Great Lakes region and threatened elsewhere as of 1986.[13] In 1988, the population on the North American breeding grounds was estimated to be about 4300 adults (Table 1). Piping Plovers winter in the southern United States, Mexico and on Caribbean Islands,[14] however wintering ground surveys have only accounted for about 1730 individuals (adults and young in their first year).[15]

About the turn of the last century, hunting contributed to the plover's decline,[7] but more recently, water level regulation, habitat modification, predation and human disturbance have been implicated.[11]

The present overview, an expanded version of an upcoming article,[10] provides an update on surveys, research and conservation activities by various Canadian agencies and provides a major focus on the period 1985-1988. Information prior to this period can be found in Haig[11] and McNicholl[61] while some material, falling in the period discussed in this current paper, has been discussed by McNicholl[61] and Haig and Oring.[17]

Table 1. NORTH AMERICAN PIPING PLOVER POPULATION ESTIMATES FOR 1988.

Location	*Number of adults*	*Source*
Prairie and Plains		
Canada	925	see Table 2
United States	1612	Susan Haig, unpubl. data
Great Lakes		
Canada	0	Susan Haig, unpubl. data
United States	31	Susan Haig, unpubl. data
Atlantic coast		
Canada	465	see Table 2
United States	1288	Anonymous[5]
Totals		
Canada	1390	
United States	2931	
North America	4321	

Surveys - Distribution and Abundance

National Perspective

The Piping Plover is found in nine of the ten Canadian provinces[36] (Figure 1) and breeds in two principal regions defined in this paper as Prairie Canada (Alberta, Saskatchewan, Manitoba, western Ontario) and Atlantic Canada (Quebec, Nova Scotia, New Brunswick, Prince Edward Island, Newfoundland). Until 1977, Piping Plovers also nested in the Canadian Great Lakes region[35] although breeding may have occurred more recently, in 1981 and 1988.[9]

Based on 1988 data, about 32% (nearly 1400 adults) of the North American Piping Plover population occurs in Canada (Table 1 and 2). Estimates of the Canadian population, published in 1985, ranged from about 715-1115 pairs;[36 71] an estimate for 1986 was about 800-865 pairs[41] and less than 700 pairs for 1988 (Table 2). An international Piping Plover survey in 1991 on both breeding and wintering grounds will provide the best population estimates to date.

Prairie Canada

Sixty-six percent of the Canadian population is found in Prairie Canada

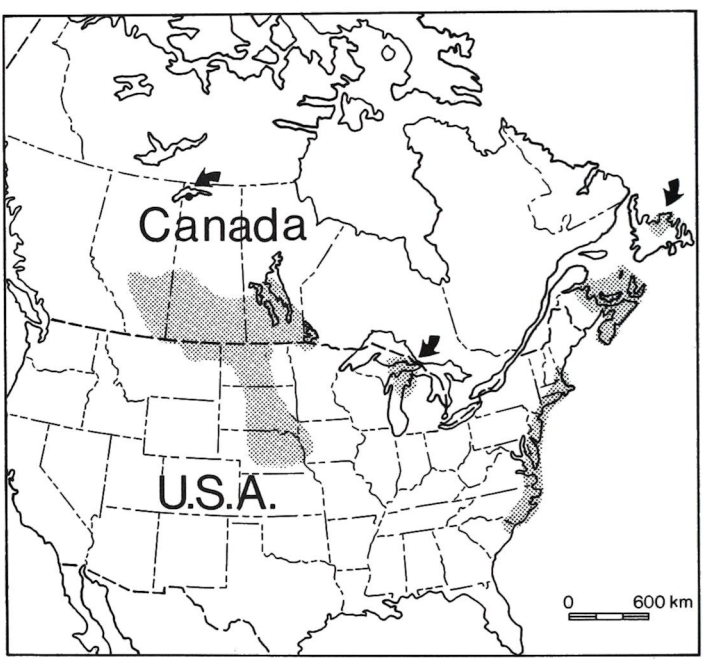


Figure 1. *North American breeding distribution of the Piping Plover (after Haig et al.[41] and S. Haig, pers. comm.)*

(Table 2). In Alberta, the Piping Plover breeding population prior to 1978 was estimated to be 100-110 pairs,[84] but the first major survey, carried out in 1986, revealed a total of 288 adults.[83] Additional areas checked in 1987 resulted in one more breeding area being located near Mestiskow.[79] Since 1900, habitat loss in Alberta is thought to have resulted in a decrease in breeders of less than 10%, however drought conditions in 1988 resulted in no productivity at some locations and is thought to have influenced a decline in the provincial population.[82]

The northern-most Canadian record of breeding Piping Plovers occurred in Saskatchewan at Lake Athabasca and extended the previously known range by 685 km.[1] Recent occurrences of Piping Plovers in Saskatchewan have mostly been documented on lands under federal or provincial jurisdiction.[17]

Changing habitat conditions,[43] possible reduction in the population[12] and data evaluation[73] have influenced the interpretation of Saskatchewan Piping Plover population estimates. In 1984, the Saskatchewan population was estimated to be between 2000-2500 plovers. This estimate was based on known and extrapolated data from lake surveys plus an estimate of the remaining potential habitat for plovers in Saskatchewan.[48] However, the 1986 provincial estimate was down 67% at about 700-800 adults[41] and down further to 500 individuals in 1988 (Wayne Harris, pers. comm.). Big Quill Lake, one of the largest and most populated breeding sites in North America, was estimated to have 300+ adults in 1985[47] but a survey done the following year reported less than 50% of that number.[42] The adult population count was up somewhat in 1987, but the number of observed young was down by 46% from 1986.[44 42] In 1988, only 107 adults and 17 young were reported. Drought conditions[45] probably contributed to decreased numbers of plovers at Big Quill Lake with adults possibly going to different sites.[42]

Populations at Redberry Lake, a site considered for recreational develop-

Table 2. CANADIAN PIPING PLOVER POPULATION ESTIMATES FOR 1988.[a]

Province	*Number of adults*	*Source*
Prairie Canada		
Alberta	220+	Wershler[82]
Saskatchewan	500	Wayne Harris
Manitoba	200	Bill Koonz
Ontario (Lake of the Woods)	5	Maxson *et al.*[59]
Atlantic Canada		
Quebec	74	Pierre Laporte CWS[b]
Newfoundland	8	Bruce Johnson CWS
Prince Edward Island	91	Bruce Johnson CWS
Nova Scotia	102[c]	Flemming *et al.*[25]
New Brunswick	190	Bruce Johnson CWS
Total	1390	

[a] Some estimates reflect 1987 or earlier data as complete surveys were not carried out in all provinces in 1988.
[b] CWS - Canadian Wildlife Service.
[c] Average taken of 1987 range (48-54 pairs).

ment,[74] remained stable at or about 40 individuals in 1984[48] and 1985.[53] At Lake Diefenbaker, an artificial lake created by damming the South Saskatchewan River, fluctuating water levels significantly influence habitat availability for Piping Plovers. In 1984, when water levels were low and habitat was available to plovers, 223 individuals were seen during a survey of about 63% of the eastern part of Lake Diefenbaker's shoreline.[48] In 1986, plovers did not nest because of high water levels.[46] Habitat was available in 1988, however, only 97 adults were found even though more shoreline was covered[46] than in 1984.[48]

Relatively few plovers have been reported on river habitat in Prairie Canada. This contrasts with considerable use of riverine sandbar habitat by plovers in the American great plains.[41] The discovery, in 1988, of 44 plovers along the South Saskatchewan River downstream from Lake Diefenbaker[46] has increased an awareness of the plover's use of river habitat in Prairie Canada. It is not known what, if any, importance rivers have as an alternative nesting area for displaced breeding plovers during drought years when lakes such as Chaplin and Old Wives have little or no water and very few plovers (Wayne Harris, unpubl. data).

Manitoba's plover population, based on data from surveys carried out prior to 1987, is estimated to be about 120-130 individuals.[33, 34] Several previously unknown sites with one or more plovers were located in 1987 by the Manitoba Department of Natural Resources.[64] In 1988 the population was estimated at close to 200 plovers. This increase is thought to have possibly been a result of drought in other areas influencing plovers to move into Manitoba.[54]

The Piping Plovers at Lake of the Woods in western Ontario are included in the plains population.[69] This is the only known annual breeding population in Ontario[55] consisting of up to 10 adults (1981-1988).[55, 50, 51, 52, 59]

Great Lakes Canada

Historically, the Great Lakes population in Ontario has been estimated at about 150-160 pairs, with most at Lake Erie, particularly Long Point.[69] The species' decline in the Great Lakes region has been so great that it can be considered extirpated[69] although there are two possible breeding records (1981 and 1988) in the last decade.[9] Human disturbance[69] and predation[55] are thought to have contributed to the decline.[69]

Atlantic Canada

The Piping Plover population in Atlantic Canada ranged from about 445-500 adults based on 1982 and 1984 information.[36] The 1988 population estimate for Atlantic Canada, 465 adults, is approximately 34% of the Canadian plover population with 82% of the Atlantic Canada plovers occurring in New Brunswick, Nova Scotia and Prince Edward Island (Table 2). In these latter provinces, the annual breeding population at three National Parks has ranged from 45 to 52 pairs during 1984 to 1988. The lowest breeding population for Kouchibouguac National Park, New Brunswick, was recorded in 1988 with only nine breeding pairs reported, down from the high of 21 in 1983. In contrast, Prince Edward Island National Park had its highest count in 1988, with 28 breeding pairs located.[13] The breeding population in Kejimkujik National Park's Seaside Adjunct, Nova Scotia has varied from a high of at least 27-29 pairs in 1976 (data only from Cadden Beach[10] currently St. Catherines River Beach[68]), to nine breeding pairs in 1987.[13] In 1988, the Canadian Parks Service (CPS), in addition to surveying plovers in National Parks, also surveyed nine provincial beaches in Nova Scotia and recorded 12-14 breeding pairs and 13 fledged chicks.[67] In Quebec the population is estimated to be less than 40 pairs (Table 2). Since 1979, population

estimates for the Magdalen Islands have varied from 30 pairs in 1979[12] to 20 pairs in 1983[18] to 37 pairs plus four individuals in 1987.[70] Surveys prior to 1987 were not considered to be exhaustive as was the 1987 survey, and therefore evaluating the population trend is difficult.[70] However the latter report concluded the population was fairly stable. In the 1980s, the Newfoundland plover population appears to have remained at less than 12 adults (Joe Brazil, pers. comm.).

In Nova Scotia, a decrease of 3.3-5.8 pairs/year was believed to have occurred from 1983 to 1987.[25] In Quebec, adults and young were seen along the Gulf of St. Lawrence's north shore as recently as 1986,[87] however no Piping Plovers were seen during a 1988 survey.[20]

Research

National Perspective

Only four major research projects on Piping Plover biology have been completed in Canada - two in Prairie Canada[35 85] and two in Atlantic Canada.[10 23]

Prairie Canada

Whyte conducted a two-year study at Big Quill Lake, a large prairie lake in Saskatchewan. His fieldwork concentrated on breeding chronology, territoriality, choice of nest locations and reproductive success. Hatching success was only 28.6% in 1980 and 8.8% in 1981 while fledging success was considerably higher (66.7% in 1980 and 86.0% in 1981). Predation by Ring-billed Gulls was suspected and may have caused the poor nest success.[85]

In Manitoba, Haig carried out a major study of the breeding biology of Piping Plovers.[35] She found that almost 70% of adults which survived returned the following year to the area where they had bred and that there was no significant difference in return rates between males and females. Although most pairs changed mates between years, the majority retained mates after nest loss.[39] Like Whyte,[85] Haig found nest success to be poor with 64% of the nests failing in her study, most likely because of predation, storms and human disturbance. She determined that only about one chick fledged from a nest.[39] Haig also did genetic research on various North American populations; no convincing support could be found for taxonomically dividing this plover into two subspecies[55] as does the American Ornithologists' Union.[3] Haig has also provided the most comprehensive overview of Piping Plover distribution in North and Latin America.[36 40]

A recent analysis of Piping Plover productivity data from the Prairie Canada and American great plains population questions whether the population will sustain itself since not enough young may be being produced. Using a theoretical model to determine productivity required for population stability, researchers determined that between 1.15-1.44 fledged chicks/pair is required to maintain the western population. Known productivity was found to be only 1.12 ± 0.33 (standard error) fledged chicks/pair in the prairie and plains population. Theoretical production values, which serve as a tentative benchmark need to be tested further.[27]

Atlantic Canada

Cairn's research in Nova Scotia resulted in the first comprehensive description of Piping Plover territorial and courtship behaviour.[10 11] She found that fledging success was lower on beaches with greater recreational activity compared with her main study area, Cadden Beach, which had more limited recreational use.[10 11] A one-season study by Tull in and near Kouchibouguac National Park, New Brunswick, found that reproductive success in early nests was greater than those initiated later.[76] Tull also found that human disturbance or lack thereof, was

not an important factor affecting productivity, however disturbance was relatively limited at his study site and may not have been sufficient to show an impact. Further study in Nova Scotia revealed that disturbance was not an important factor for young chicks (10 days) but was for older chicks (17 days).[25] For this latter group, significantly fewer survived per pair (0.5) on beaches with disturbance compared with those surviving (1.8) on beaches with less activity. This study suggests behavioural changes in response to human presence such as decreased chick brooding and feeding, may make chicks more vulnerable to predation and the elements.

Productivity has also been determined by CPS for Piping Plovers breeding in some Atlantic National Parks. The number of chicks fledged per pair has varied from 1.5-2.2 in Kouchibouguac National Park [76] [13] to 0.7-2.8 in Prince Edward Island National Park [15] [63] [86] to 0.3-2.1 in Kejimkujik National Park.[68] [11]

In Nova Scotia, during 1979-1983, fledging success was reported to be 1.2 chicks/pair/nest initiated.[25] It should be noted that there is variation in the above studies as to the definition of a fledged chick and some give minimum-maximum ranges because of the difficulty in determining the number of fledged chicks.

Conservation

National Perspective

Piping Plovers are protected by the Migratory Birds Convention Act of 1917 and additional conservation measures are afforded through the Canada Wildlife Act of 1973. As of fall 1990, Canada has no federal endangered species act, but Manitoba (Bill Koonz, pers. comm.), Quebec (Pierre Laporte, pers. comm.), Ontario and New Brunswick have endangered species legislation.[77] At the national level, species status designations in Canada are assigned by COSEWIC but do not carry legislative powers.

After the Piping Plover's status had been upgraded in 1985 from threatened to endangered in Canada by COSEWIC, steps were taken to develop a national approach to conserving the species by laying the groundwork for a national recovery plan.[60] The recovery plan[6] has been approved (Tim Lash, pers. comm.) and is complementary to the two American recovery plans already in place.[22] [41] Research and conservation actions, outlined in the Canadian Piping Plover Recovery Plan, are aimed at retaining the Canadian plover population and its distribution.[6] Overall Canadian recovery efforts are administered through a national coordinator while two regional teams are responsible for regional planning. Recently, Canada and the United States have recognized that international cooperation is important to Piping Plover conservation and have participated jointly in recovery team meetings.

Federal, provincial and nongovernment agencies have initiated a variety of research and/or conservation measures (Table 3). Nongovernment agencies have been successful in providing publicity about the plover's plight and have supported plover surveys and conservation. For example, the Canadian Nature Federation has been active in habitat preservation (B. T. Aniskowicz, pers. comm.) and through its publication, *Nature Canada*, has made Canadians aware of this plover.[3] [62] [74] Support for survey work has come from World Wildlife Fund (WWF), the Elsa Wild Animal Appeal of Canada, the Saskatchewan Natural History Society (SNHS),[29] the Province of Quebec Society for the Protection of Birds[70] and the Natural History Society of Prince Edward Island (NHSPEI) (Dan McAskill, pers. comm.). Ducks Unlimited, SNHS, Wildlife Habitat Canada and WWF have supported habitat enhancement efforts (Dale Hjertaas, pers. comm.).

Table 3. PIPING PLOVER RESEARCH AND CONSERVATION ACTIVITY IN CANADA.

	Official Provincial Status	*Surveys*	*Banding*	*Habitat Development*	*Signage*	*Patrols*	*Management Plan*[a]	*Public Information/ Education*
Atlantic Canada								
Newfoundland	None	•				•	•[b]	•
Prince Edward Island	None	•			•	•	•[b]	•
Nova Scotia	None	•	•[c]	•	•	•	•[b]	•
New Brunswick	None	•	•[d]		•	•	•[b]	•
Quebec	None	•					•	•
Great Lakes Canada								
Ontario	Endangered	•					•	•
Prairie Canada								
Ontario	Endangered	•			•	•	•	•
Manitoba	None	•	•	•	•		•	•
Saskatchewan	None	•	•	•				
Alberta	Endangered[e]	•	•				•	•

[a] Approved or *in preparation.*
[b] Refers to a Canadian Parks Service management plan. No provincial plan prepared.
[c] Cairns.[11]
[d] Haig and Oring.[38]
[e] Listed as endangered under the Alberta Wildlife Act but in policy the status is considered as vulnerable. Note that the term endangered in the Act encompasses species considered to be endangered, threatened and vulnerable (Steve Brechtel, pers. comm.).

Prairie Canada

Within the last five years, the participation of agencies in Piping Plover conservation in Prairie Canada has increased and demonstrates a heightened interest in this migratory plover. The Prairie Piping Plover Recovery Team has identified priority action plans.[29] These strategies will serve to implement the interests of the national plan at the regional level. In addition to the national recovery plan, provincial management or recovery plans have been initiated in Ontario,[28] Manitoba[34 8] and Alberta.[82]

General suggestions regarding Piping Plover management in Alberta have been previously outlined[78] while specific management suggestions have been made for protecting plover habitat from cattle disturbance and/or recreational activities at Little Fish Lake and one of the Reflex Lakes.[80 81] Habitat enhancement projects have been initiated in both Saskatchewan and Manitoba. Nesting substrate has been increased at two lakes in Saskatchewan, Chaplin[45a] and Little Quill, through the spreading of gravel on lakeshore habitat (Dale Hjertaas, pers. comm.). Since Piping Plovers successfully use a variety of artificial habitats for nesting,[31] a proposed dyke to enhance waterfowl production, at Old Wives Lake in southern Saskatchewan, if constructed, may provide suitable plover nesting habitat.[32] In Manitoba, habitat modification has been attempted at Lake Winnipeg (Bill Koonz, pers. comm.) and Lake Manitoba.[34] In 1982, breeding habitat on the southeastern shore of Lake Manitoba was protected by the Manitoba government declaring the site a Special Conservation Area.[34] A sign at Sable Islands Provincial Nature Reserve, Lake of the Woods, Ontario was erected in part to contribute to conserving breeding Piping Plovers (Leo Heyens, pers comm.).

Great Lakes Canada

Although Piping Plovers do not currently breed in this part of Canada, both the proposed national[6] and Ontario[28] recovery plans have set as one of their goals, the re-establishment, if feasible, of the plover in this region.

Atlantic Canada

Of nine National Parks and one National Park Reserve in Atlantic Canada, only Prince Edward Island National Park, Kouchibouguac National Park and Kejimkujik National Park's Seaside Adjunct harbour Piping Plovers. Each of these three parks has a management plan for Piping Plovers.[14 26 68] CPS has used signs, fences and warden patrols to afford protection to some nesting areas and interpretive hikes, slide shows and pamphlets assist in educating the general public (Gary Corbett, pers. comm.). Since maritime storms cause nest loss,[4] CPS has considered removing eggs, incubating them and then replacing them (Gary Corbett, pers. comm.). Piping Plover eggs have been successfully hatched by artificial means and the resulting young released into the wild.[63] Predation is considered to be a greater problem than human disturbance in Atlantic Canada, but it may be related indirectly to human activity (Gary Corbett, pers. comm.). Efforts to control predators have been attempted[67] and nest exclosures have been successfully used in decreasing predation.[21] Since there is evidence to suggest that plovers have a higher hatching success when nesting near breeding terns than in the terns' absence, consideration should be given to the suggestion to manage tern colonies in order to benefit plover conservation.[16] CPS has also compiled an extensive bibliography with over 200 references cited on literature pertaining to this species.[57]

For more than 10 years, the NHSPEI has been actively promoting Piping Plover conservation. The society has conducted surveys for plovers, helped in planning workshops, initiated a program to contact landowners, and supported public relation efforts including a Piping Plover

video and poster (Dan McAskill, pers. comm.). The landowner contact program revealed over 75% support by landowners for plover conservation. Disturbances identified by landowners included use of All Terrain Vehicles, habitat alteration and recreational activities.[58]

On Quebec's Magdelan Islands, beach traffic during the plover's breeding season is heightened in July during part of the chick-rearing period. The primary conservation recommendation for these islands is to control traffic so as to decrease nest loss and secondarily to consider habitat creation.[70] Additional discussion on plover conservation is found in a draft Quebec recovery plan.[56]

A diversity of techniques has been used in attempts to increase populations of different bird species,[75] however, only limited experimentation has been initiated to encourage plover productivity and none has yet been used to increase genetic diversity. Reciprocal egg fostering among different plover demes has been suggested as a means to increase genetic diversity.[24] However a recent genetic study has shown that inbreeding in Piping Plovers is not a concern.[38]

The future of the Piping Plover in Atlantic Canada is somewhat clouded by a predicted warming trend in the earth's climate which may result in coastal flooding[49] thereby reducing available nesting habitat and decreasing plover productivity. However, any future threats to the plovers and their coastal habitat will be challenged by the concern and commitment of dedicated conservationists in Atlantic Canada to attempt to ensure the continuing presence of the Piping Plover on east coast beaches.

Conclusion and Recommendations

Most provinces, with the exception of Saskatchewan, have an adequate

Piping Plover *Geoff Holroyd*

account of the Piping Plover populations within their jurisdictions. Furthermore, population estimates in Saskatchewan have varied considerably between researchers, and the importance of clarifying the abundance of plovers in this province is of international significance, as the estimated population may account for 12% (Table 1) to perhaps 50% of the total continental population.[48]

In Prairie Canada there are several concerns which need to be addressed. Further clarification of the plover's distribution and protection of its habitat is needed. As to research, long-term data are needed on population dynamics, dispersal and productivity to determine the nature of population fluctuations and the adequacy of reproductive output in maintaining a self-sustaining population.

In Atlantic Canada, information is needed on wintering locations of the breeding population (Richard Dyer, pers. comm.) while research and management is required to reduce nesting failure caused by predators and storms. The possible impact of illegal shorebird hunting in some locations in Newfoundland[19] should be evaluated and appropriate action taken to provide public education. In both Atlantic and Prairie regions, conservation must take priority if the plover's status is to be downlisted or de-listed. In order to effectively conserve the continental breeding population of Piping Plovers, joint action by Americans and Canadians[72] must continue in cooperation with those Latin American countries where the plovers winter. Finally, it is of utmost importance that landowners and the general public take responsible conservation actions for habitat preservation during occupational and recreational activities.

Acknowledgements

I thank B. T. Aniskowicz (Canadian Nature Federation), Peter Austin-Smith (Nova Scotia Department of Lands and Forests), Irene Bowman (Ontario Ministry of Natural Resources (OMNR)), Joe Brazil (Department of Culture, Recreation and Youth, Newfoundland), Joe Carreiro (Canadian Wildlife Service (CWS), Ontario), David Cartwright (Department of Natural Resources, New Brunswick), Gary Corbett (CPS, Atlantic Region), Bill Darby (OMNR), Randy Dibblee (Department of Community and Cultural Affairs, Prince Edward Island), Richard Dyer (USFWS), Gary Erickson (Department of Forestry, Lands and Wildlife (DFLW), Alberta), Dale Hjertaas (Department of Parks and Renewable Resources (DPRR), Saskatchewan), Bruce Johnson (CWS, Atlantic Region), Bill Koonz (Department of Natural Resources, Manitoba), Pierre Laporte (CWS, Quebec Region), Michel Lepage (Ministère du Loisir de la Chasse et de la Pêche, Quebec) Dan McAskill (NHSPEI) and Dave Moore (DFLW, Alberta) for providing me with information on research and/or conservation in their various jurisdictions. The Potash Corporation of Saskatchewan kindly provided me with survey reports for Big Quill Lake. Gary Corbett (CPS), Roger Edwards (CWS), Gary Erickson (DFLW), Susan Haig (USFWS), Peter Hicklin (CWS), Dale Hjertaas (DPRR), Bruce Johnson (CWS), Pierre Laporte (CWS), Guy Morrison (CWS), Sheila Lamont (Saskatchewan Natural History Society) and two reviewers each commented on a draft(s) of the manuscript. Susan MacEachran (CWS) drafted the figure.

[1] ADAM, C.I.G. 1984. Piping Plover, *Charadrius melodus*, at Lake Athabasca, Saskatchewan: a significant northward range extension. Can. Field-Nat. 98:59-60.

[2] AMERICAN ORNITHOLOGISTS' UNION. 1983. Check-list of North American birds, 6th ed. Am. Ornith. Union, Washington, D.C. 877 pp.

[3] ANONYMOUS. 1986. Plover target of conservationists. Nat. Canada 15(1):49.

[4] ANONYMOUS. 1986. Annual review 1985-1986. Can. Wildl. Serv. 35 pp.

[5] ANONYMOUS. 1989. Birdnotes. The Living Bird 8(3):5.

[6] ATLANTIC AND PRAIRIE PIPING PLOVER RECOVERY TEAMS. *In preparation.* Canadian Piping Plover recovery plan.

[7] BENT, A.C. 1929. Life histories of North American shore birds. Smiths. Inst. U. S. Nat. Mus. Bull. 146.

[8] BERGER, R. 1988. Piping Plover (*Charadrius melodus*) recovery plan for Manitoba. Unpubl. draft. Univ. of Man. 45 pp. plus appendices.

[9] BURNETT, J. A., C. T. DAUPHINÉ, Jr., S. H. MCCRINDLE and T. MOSQUIN. 1989. On the brink. Western Producer Prairie Books, Saskatoon. 192 pp.

[10] CAIRNS, W.E. 1977. Breeding biology and behaviour of the Piping Plover (*Charadrius melodus*) in southern Nova Scotia. Unpubl. M. Sc. thesis, Dalhousie Univ. 100 pp. plus appendices.

[11] CAIRNS, W.E. 1982. Biology and behavior of breeding Piping Plovers. Wilson Bull. 94:531-545.

[12] CAIRNS, W.E. and I.A. MCLAREN. 1980. Status of the Piping Plover on the east coast of North America. Am. Birds 34:206-208.

[13] CORBETT, G.N. 1988. Summary Report. Status of Piping Plover in Canada's National Parks 1988. Unpubl. Can. Parks Serv. report. 4 pp.

[14] CORBETT, G.N. and B.I. BALL. 1980. A management plan for Piping Plover, *Charadrius melodus*, in Prince Edward Island National Park. Unpubl. report for Parks Canada, Atlantic Region. 61 pp. plus appendices.

[15] CROWE, A. 1984. Piping Plover survey Prince Edward Island National Park. Unpubl. report for the Can. Wildl. Serv. and Parks Canada. 23 pp. plus tables, figures and appendices.

[16] CROWE, A. 1987. 1987 Piping Plover survey Prince Edward Island National Park. Unpubl. Parks Canada draft report.

[17] DALE, B. 1986. Land tenure of areas critical to Piping Plovers in Saskatchewan. Unpubl. report prepared for the Sask. Natural History Soc., Saskatoon. 24 pp.

[18] DAVID, N. 1983. The nesting season June 1 - July 31, 1983. Quebec Region. Am. Birds 37:970-971.

[19] DEICHMANN, H. and R. BURROWS. 1983. Importance of the northeast coast of Newfoundland from Deadmans Bay to Cape Freels to migrant and nesting shorebirds and the threat these birds face from illegal shooting. Osprey 14:9-14.

[20] DEMERS, A. and P. LAPORTE. 1988. Inventaire des habitats du Pluvier siffleur sur la Côte Nord et en Gaspésie. Unpubl. Can. Wildl. Serv. report. 45 pp.

[21] DRYSDALE, C., D. REIVE and G. KENNEY 1988. An evaluation of Piping Plover (*Charadrius melodus*) nest protection strategy in the Kejimkujik National Park Seaside Adjunct. Unpubl. Can. Parks Serv. report. 11 pp.

[22] DYER, R.W., A. HECHT, S. MELVIN, C. RAITHEL and K. TERWILLIGER. 1988. Atlantic Coast Piping Plover recovery plan. U. S. Fish and Wildl. Serv., Newton Corner, Mass. 66 pp. plus an appendix.

[23] FLEMMING, S.P. 1984. The status and responses of Piping Plover (*Charadrius melodus* Ord) to recreational activity in Nova Scotia. Unpubl. B. Sc. thesis, Acadia Univ. 46 pp. plus tables, figures and appendices.

[24] FLEMMING, S.P. 1987. Natural and experimental adoption of Piping Plover chicks. J. Field Ornithol. 58:270-273.

[25] FLEMMING, S.P., R.D. CHIASSON, P.C. SMITH, P.J. AUSTIN-SMITH and R.P. BANCROFT. 1988. Piping Plover status in Nova Scotia related to its reproductive and behavioral responses to human disturbance. J. Field Ornithol. 59:321-330.

[26] FONTAINE, N. and G. DELANEY. 1985. Piping Plover management plan

Kouchibouguac National Park. Unpubl. report for Parks Canada, Atlantic Region. 18 pp. plus appendices.

[27] GAINES, E.P. and M.R. RYAN. 1988. Piping Plover habitat use and reproductive success in North Dakota. J. Wildl. Mgmt. 52:266-273.

[28] GERSON, H. 1988. Recovery plan for the Piping Plover in Ontario. Unpubl. draft. Ont. Ministry of Natural Resources.

[29] GOOSSEN, J.P. 1989. Prairie Piping Plover conservation: first annual report (1988). Unpubl. Can. Wildl. Serv. report. 19 pp.

[30] GOOSEN, J.P.(sic) 1990. Surveys and conservation of Piping Plovers in Canada. *Wader Study Group Bull.* 57:53-57.

[31] HAIG, S. 1985. The status of the Piping Plover in Canada. Report to the Committee on the Status of Endangered Wildlife in Canada. Nat. Mus. of Natural Sciences, Ottawa. 34 pp.

[32] HAIG, S. 1986. Ducks Unlimited Wood River Delta/Old Wives Lake development: Piping Plover assessment. Unpubl. report to Ducks Unlimited Canada. 11 pp. plus appendix and attachments.

[33] HAIG, S. 1986. Distribution and status of Piping Plovers in Manitoba - 1986. Unpubl. report prepared for the Man. Dept. of Natural Resources and World Wildlife Fund (Canada). 10 pp.

[34] HAIG, S.M. 1987. Piping Plovers in Manitoba - a status report on the species and initial recovery plan for the province. Pp. 243-247 *In* HOLROYD, G.L., W.B. MCGILLIVRAY, P.H.R. STEPNEY, D.M. EALEY, G.C. TROTTIER, and K.E. EBERHART. Proceedings of the workshop on endangered species in the prairie provinces. Prov. Mus. of Alberta Occ. Paper No. 9. 367 pp.

[35] HAIG, S.M. 1987. The population biology and life history patterns of the Piping Plover. Ph.D. dissertation, Univ. of N. Dakota. 121 pp.

[36] HAIG, S.M. and L.W. ORING. 1985. Distribution and status of the Piping Plover throughout the annual cycle. J. Field Ornithol. 56:334-345.

[37] HAIG, S.M. and L.W. ORING. 1987. The Piping Plover. Pp.508-519 *In* Audubon Wildl. Report 1987. Nat. Audubon Soc. Academic Press, Orlando.

[38] HAIG, S.M. and L.W. ORING. 1988. Genetic differentiation of Piping Plovers across North America. Auk 105:260-267.

[39] HAIG, S.M. and L.W. ORING. 1988. Mate, site, and territory fidelity in Piping Plovers. Auk 105:268-277.

[40] HAIG, S.M. and L.W. ORING. 1988. Distribution and dispersal in the Piping Plover. Auk 105:630-638.

[41] HAIG, S., W. HARRISON, R. LOCK, L. PFANNMULLER, E. PIKE, M. RYAN and J. SIDLE. 1988. Great Lakes and Northern Great Plains Piping Plover recovery plan. U. S. Fish and Wildl. Serv., Twin Cities, Minn. 132 pp. plus appendices.

[42] HARRIS, W.C. 1986. Big Quill Lake Piping Plover population census - 1986. Unpubl. report prepared for the Potash Corp. of Sask. 13 pp.

[43] HARRIS, W.C. 1987. Saskatchewan Piping Plovers. Pp. 239-242 *In* HOLROYD, G.L., W.B. MCGILLIVRAY, P.H.R. STEPNEY, D.M. EALEY, G.C. TROTTIER, and K.E. EBERHART. Proceedings of the workshop on endangered species in the prairie provinces. Prov. Mus. of Alberta Occ. Paper No. 9. 367 pp.

[44] HARRIS, W.C. 1987. Big Quill Lake Piping Plover population census - 1987. Unpubl. report prepared for the Potash Corp. of Sask. 11 pp.

[45] HARRIS, W.C. 1988. Saskatchewan Piping Plover populations (1984 - 1988). Unpubl. abstract prepared for the Northern Great Plains Great Lakes Piping Plover meeting held in Lincoln, Neb., 1 November 1988.

[45a] HARRIS, W.C. 1988. Piping Plover census and evaluation of the effects of experimental habitat enhancement at Chaplin Lake, Saskatchewan. Unpubl. report prepared for Sask. Natural History Soc. 7 pp.

[46] HARRIS, W.C. 1988. South Saskatchewan River Piping Plover Survey - 1988 (Lake Diefenbaker segment - Riverhurst Ferry to Dam). Unpubl. report prepared for the Sask. Nat. History Soc. 10 pp. plus map.

[47] HARRIS, W.C. and S.M. LAMONT. 1985. Big Quill Lake Piping Plover population survey -- 1985. Unpubl. report prepared for the Potash Corp. of Sask. 24 pp.

[48] HARRIS, W., G. WAPPLE, R. WAPPLE, K. DESMET (sic) and S. LAMONT. 1985. Saskatchewan Piping Plovers - 1984. Unpubl. report prepared for the Sask. Nat. History Soc. and Sask. Parks and Renewable Resources Wildl. Branch. 106 pp. plus appendix.

[49] HENGEVELD, H.G. 1987. Understanding CO_2 and climate. Annual report 1986. Atmospheric Environment Serv., Environment Canada. 23 pp.

[50] HEYENS, L.E. 1986. Piping Plover survey Sable Islands Provincial Nature Reserve. Unpubl. field report, Ont. Ministry of Natural Resources. 2 pp. plus map.

[51] HEYENS, L.E. 1987. Piping Plover survey Sable Islands Provincial Nature Reserve. Piping Plover survey Windy Point - Lake of the Woods. Unpubl. field report, Ont. Ministry of Natural Resources. 3 pp. plus two maps.

[52] HEYENS, L.E. 1988. Piping Plover survey Sable Islands Provincial Nature Reserve. Piping Plover survey Windy Point Lake of the Woods. Unpubl. field report, Ont. Ministry of Natural Resources. 2 pp. plus map and bird checklist.

[53] KERBES, R.H. and J.L. HOWARD. 1986. Summary of bird studies and management recommendations for the Redberry Lake area. Unpubl. report prepared by Can. Wildl. Serv. and Sask. Parks and Renewable Resources Wildl. Branch. 14 pp.

[54] KOONZ, W. 1988. Piping Plover observations Manitoba 1988. Unpublished Man. Dept. of Natural Resources report. 4 pp. plus a map.

[55] LAMBERT, A.B. 1987. Piping Plover. Page 162 *In* Cadman, M.D., P.F.J. Eagles, and F.M. Helleiner. Atlas of the breeding birds of Ontario. Univ. of Waterloo Press, Waterloo. 617 pp.

[56] LAPORTE, P. 1988. Plan d'action pour le retablissement du Pluvier siffleur au Quebec. Unpubl. Can. Wildl. Serv. draft. 51 pp.

[57] LEWIS, H. 1988. Piping Plover bibliography. Unpubl. draft. Can. Parks Serv., Atlantic Region. 23 pp.

[58] MACEACHERN, P. and S. BARRETT. 1988. A: Crowbush/Lakeside Piping Plover population survey and landowner contact program. B: Hillsborough Bridge piers Common Tern colony study. Natural History Soc. of Prince Edward Island 1988 Seeds project report. 20 pp. plus appendices.

[59] MAXSON, S.J., K.V. HAWS and L.W. ORING. 1988. 1988 status and breeding summary of Piping Plovers and Common Terns at Lake of the Woods, Minnesota. Unpubl. Minn. Dept. of Natural Resources report. 8 pp. plus tables, banding schedule and a figure.

[60] MCKEATING, G. 1987. A national perspective and management strategy on the Piping Plover. Pp. 233-234 *In* HOLROYD, G.L., W.B. MCGILLIVRAY, P.H.R. STEPNEY, D.M. EALEY, G.C. TROTTIER, and K.E. EBERHART. Proceedings of the workshop on endangered species in the prairie provinces. Prov. Mus. of Alberta Occ. Paper No. 9. 367 pp.

[61] MCNICHOLL, M.K. 1985. Profiles on risk status of Canadian birds: 2. Piping Plover. Alta. Nat. 15:135-138.

[62] MCSWEENY, B.T. 1985. CNF launches plover action plan. Nat. Canada 14(4):53.

[63] MORSE, M. 1982. 1982 Piping Plover survey. Prince Edward Island National Park. Unpubl. Can. Wildl. Serv. and Parks Canada report. 25 pp. plus appendices.

[64] MOSZYNSKI, R., W.H. KOONZ and K. DE SMET. 1988. Manitoba Piping Plover survey, 1987. Unpubl. Man. Natural Resources Wildl. Biological Serv. manuscript report No. 88-03. 24 pp. plus appendices.

[65] NICHOLLS, J. 1988. Winter distribution of the Piping Plover (*Charadrius melodus*) along the Atlantic and Gulf Coasts. Unpubl. abstract prepared for the Northern Great Plains Great Lakes Piping Plover meeting held in Lincoln, Neb., 1 November 1988.

[66] PURDY, M.A. and B.J. WEICHEL. 1988. Piping Plover survey. South Saskatchewan River - Red Deer confluence to Miry Bay and Gardiner Dam to Saskatoon. Unpubl. report prepared for the Sask. Natural History Soc. 13 pp. plus appendices.

[67] REIVE, D. and G. KENNEY. 1988. Piping Plover (*Charadrius melodus*) monitoring program. Kejimkujik National Park Seaside Adjunct 1988. Unpubl. Can. Parks Serv. report. 35 pp. plus appendices.

[68] REIVE, D., G. KENNEY and C. DRYSDALE. 1988. A management plan for Piping Plover (*Charadrius melodus*) Kejimkujik National Park, Seaside Adjunct. Unpubl. Can. Parks Serv. report.

[69] RUSSELL, R.P. 1983. The Piping Plover in the Great Lakes region. Am. Birds 37:951-955.

[70] SHAFFER, F. and C. PINEAU. 1987. État du pluvier siffleur (*Charadrius melodus*) aux îles-de-la-Madeleine. Assoc. québecoise des groupes d'ornithologues. 15 pp. plus map, graphs, tables and appendices. (English translation and French version accessed).

[71] SIDLE, J.G. 1985. Endangered and threatened wildlife and plants; determination of endangered and threatened status for the Piping Plover. Fed. Register 50(238):50726-50734.

[72] SIDLE, J. 1987. Piping Plover on the American great plains. Pp. 249 *In* HOLROYD, G.L., W.B. MCGILLIVRAY, P.H.R. STEPNEY, D.M. EALEY, G.C. TROTTIER, and K.E. EBERHART. Proceedings of the workshop on endangered species in the prairie provinces. Prov. Mus. of Alberta Occ. Paper No. 9. 367 pp.

[73] SMITH, A.R. 1988. An analysis of Piping Plover surveys in Saskatchewan with recommendations on survey procedures. Unpubl. Can. Wildl. Serv. draft.

[74] SPEER, C. 1987. Resort on plover territory. Nat. Canada 16(1):49.

[75] TEMPLE, S.A. (ed.). 1978. Endangered birds. Management techniques for preserving threatened species. Proceedings of the symposium on management techniques for preserving endangered birds. Univ. of Wisc. Press, Madison. 466 pp.

[76] TULL, C.E. 1984. A study of the nesting Piping Plovers of Kouchibouguac National Park 1983. Unpubl. report prepared for Parks Canada. 79 pp. plus appendices.

[77] VERSTEEG, H. 1984. The protection of endangered species: a Canadian perspective. Ecology Law Quart. 11:267-304.

[78] WERSHLER, C.R. 1987. The Piping Plover in Alberta. Pp. 235-237 *In* HOLROYD, G.L., W.B. MCGILLIVRAY, P.H.R. STEPNEY, D.M. EALEY, G.C. TROTTIER, and K.E. EBERHART. Proceedings of the workshop on endangered species in the prairie provinces. Prov. Mus. of Alberta Occ. Paper No. 9. 367 pp.

[79] WERSHLER, C.R. 1988. Piping Plover breeding habitat census and monitoring program Alberta 1987. Unpubl. report prepared for World Wildlife Fund Canada,

Alberta Fish and Wildl. and the Can. Wildl. Serv. 6 pp.

[80] WERSHLER, C.R. 1988. Monitoring of Piping Plovers, habitat, and land use at Little Fish Lake, Alberta. Unpubl. report prepared for Alberta Recreation and Parks, World Wildlife Fund Canada, Alberta Fish and Wildl. and the Can. Wildl. Serv. 10 pp. plus two maps.

[81] WERSHLER, C.R. 1988. Monitoring of Piping Plovers, habitat, and land use at Reflex Lake, Alberta. Unpubl. report prepared for World Wildlife Fund Canada, Alberta Fish and Wildlife and the Can. Wildl. Serv. 10 pp. plus copy of an airphoto.

[82] WERSHLER, C. *In preparation*. Draft management plan for the Piping Plover in Alberta. Prepared for Alberta Fish and Wildlife and World Wildlife Fund (Canada).

[83] WERSHLER, C. and C. WALLIS. 1987. Status of the Piping Plover in Alberta 1986. Unpubl. report for World Wildlife Fund (Canada), Can. Wildl. Serv., and Alberta Fish and Wildl. 53 pp.

[84] WESELOH, D.V.C. and L. MCKEANE WESELOH. 1983. Numbers and nest site characteristics of the Piping Plover in central Alberta, 1974-1977. Blue Jay 41:155-161.

[85] WHYTE, A.J. 1985. Breeding ecology of the Piping Plover (*Charadrius melodus*) in central Saskatchewan. Unpubl. M. Sc. thesis, Univ. of Sask. 124 pp. plus appendix.

[86] WILLIAMS, K. A. 1983. 1983 Piping Plover survey. Prince Edward Island National Park. Unpubl. Can. Wildl. Serv. and Parks Canada report. 25 pp. plus an appendix.

[87] YANK, R. and Y. AUBRY. 1986. The nesting season June 1-July 31, 1986. Quebec region. Am. Birds 40:1180-1182.

Piping Plover nest *G.J. Smith*

OLIVACEOUS CORMORANT — FIRST RECORD FOR CANADA

FRANK BRAZIER, 2657 Cameron Street, Regina, Saskatchewan S4T 2W5

The morning of 8 September 1989 in Regina was a dull one, overcast, with occasional brief light rain showers. About 10:00 a.m. I was walking eastward on the north side of Wascana Lake and when I was opposite the north end of Willow Island I left the asphalt walkway and crossed an open area towards a gap in the dense carragana hedge which grows along the bank. The instant I reached the gap a cormorant skittered along the water in panic and flew westward out of sight. It was about 15 m from me when it took off. I thought, "What a small cormorant! And why the panic?" The Double-crested Cormorants which frequent Wascana Lake in spring and fall often allow a fairly close approach, and then usually dive rather than fly.

Later, at about 11:30 a.m., I had reached the south end of Albert Memorial Bridge at the west end of Wascana Lake and was walking north over it when the thought struck me that the small cormorant may have joined the few Double-cresteds that are often on the deep water on the east side of the bridge (which contains a weir), so I stopped at a bench and scanned the water. Sure enough! With four Double-cresteds I could see the small one swimming placidly, and through my binoculars I could see that its neck was noticeably thinner and shorter than that of the others; the gular pouch was a dull yellow, with some white on either side. The front of the neck and that part of the breast visible was also yellowish, indistinguishable from the pouch colour at that distance (ca. 25 m). The most noticeable feature was its small size compared with the Double-cresteds.

My car was parked nearby and shortly I was describing the bird to Paul James, Saskatchewan Museum of Natural History staff. Since it was nearly noon he decided to go and look, as the locale was nearby. I told him to look for a small cormorant, about half the size of the others.

After I got home about 12:30 p.m. I called Robert Kreba at his home and when I had described the bird to him he offered an identification as an Olivaceous Cormorant, because that small cormorant had been seen in South Dakota. Regrettably, neither Paul James nor Robert Kreba were able to find the bird I had seen, nor did anyone else.

Once Bob had given me the clue I searched the bird books I had for a positive identification. Robbins pictured an immature Olivaceous with the light stripe on the foreneck and white on the face;[1] it reaches the Louisiana Coast where it breeds. Lowery states: "The body of this species is about half as large in bulk as that of the Double-crested Cormorant..."[2] so my remarks to Paul James were correct as to size. Lowery also notes: "Immatures of the two species in the first winter plumage are indistinguishable from each other in the field except by size."[3]

The normal range of the Olivaceous Cormorant extends from the Louisiana coast south to Tiera del Fuego on coastal waters and fresh lakes and streams. My own records are of observations in Mazatlan, Mexico (1975), Trinidad (1976), Belize (1978) and Panama (1980) but I do not recall seeing immatures, which the Wascana bird obviously was.

ffrench notes that the Olivaceous Cormorant is a game bird in Trinidad and Tobago.[4] My experience in Mexico leads me to suggest that these birds are also taken for the pot, along with anything else that's edible. This would explain the panic flight I saw.

This cormorant in the literature has been known as Neotropic, Brazilian, Mexican, and Bigua, but Olivaceous is the name now used.

The Olivaceous Cormorant often appears on the California coast, and there are some inland records. Possibly those that occur in the Gulf of California wander north as there are records in southeastern Arizona at Lake Patagonia,[7] at El Paso, Texas (31 Jan., 10 Feb. 1983), and Nebraska (Oct. 1982),[10] at Lake Mead, Nevada (16 Dec. 1978, 12 March 1979),[5, 6] Lamar, Colorado (17 July - August 1988); Pierre South Dakota (3 July - 16 August 1985 - first state record),[3] Pierre, S. Dakota, (23 June 1987 - second state record).[1]

I have searched the "Indexes of bold-faced birds" of *American Birds* and its predecessor *Audubon Field Notes* back to V. 21 (1967), as well as every issue of *Birdfinding in Canada*, and the indexes of *Canadian Field-naturalist* and its predecessors back to 1924, without finding any mention of Olivaceous (Neotropic) Cormorant. The books *Birds of Canada*, revised edition, and *The naturalist's guide to the Victoria region* do not record it, nor does the *Checklist of birds of Victoria and Southeastern Vancouver Island* (May 1989). If any bird wandered north along the Pacific coast to Canada the latter two publications probably would have recorded such a momentous event. In addition I wrote to R.W. Nero in Winnipeg, but he knew of no sightings for Manitoba, and also Alan Wormington, of Point Pelee National Park, who stated "There is definitely *no* record of Olivaceous Cormorant in Canada." I believe my sighting of one on 8 September 1989 on Wascana Lake in Regina is the first for Canada.

I thank Robert Nero and Alan Wormington for their assistance.

I offer the above sighting of an Olivaceous Cormorant as an addition to the hypothetical list of Saskatchewan birds.

[1] BERKEY, G.B. 1987. The nesting season, June 1 - July 31, 1987. *Am. Birds* 41(3).

[2] DAVIS, W.A. and S.M. RUSSELL. 1979. Birds in southeastern Arizona. Tucson Audubon Soc., Tucson.

[3] FAANES, C.A. 1985. The nesting season, June 1 - July 31, 1985. *Am. Birds* 39(5).

[4] FFRENCH, RICHARD. 1973. A guide to the birds of Trinidad and Tobago. Livingston Publ. Co., Wynnewood, Pa.

[5] KINGERY, H.E. 1979. The winter season, Dec. 1, 1978 - Feb. 28, 1979. *Am. Birds* 33(3).

[6] KINGERY, H.E. 1979. The spring migration, Mar. 1 - May 31, 1979. *Am. Birds* 33(5).

[7] KINGERY, H.E. 1985. The nesting season, June 1 - July 31, 1985. *Am. Birds* 42(5).

[8] LOWERY, G.H., Jr. 1960. Louisiana birds. Louisiana State Univ. Press, Baton Rouge.

[9] ROBBINS, C.S. 1966. Birds of North America. Golden Press, N.Y.

[10] WILLIAMS, FRANCES. 1983. The winter season, Dec. 1, 1982 - Feb. 28, 1983. *Am. Birds* 37(3).

INAPPROPRIATE ESCAPE BEHAVIOUR OF CANADA GEESE WITH YOUNG

E. OTTO HOHN, 11511 - 78 Avenue, Edmonton, Alberta. T6C 0N4

On the afternoon of 20 May 1990 I disturbed a Canada Goose from a point of land on Hastings Lake (about 40 km e of Edmonton). As the goose took to water its young, which swam in a row ahead of the adult, became visible and it became evident that they were led by another parent which swam so completely submerged that only the brownish hump of its back was visible above the water. I watched the family through 8x40 binoculars as they swam quickly until they were at least 60 m away from me. During this time the submerged adult never raised its head above water to take a breath while the nearer adult swam with neck very erect and was evidently keeping an eye on me.

Bent states that when a family party of these birds moves over water the gander usually leads the procession.[1] I believe this was not the case in this instance, because the rear bird was large and was evidently standing on guard when I first became aware of the family. Furthermore, the posture assumed by the almost submerged adult resembled that adopted by incubating geese when they are aware of being observed; they lay their head and neck flat along the ground so that only the hump of their backs remains conspicuous.

This behaviour is comparable yet different from an observation by P.A. Taverner, reported by Bent. Taverner described a goose family pursued on a lake by a motor boat. The geese swam fast and arranged themselves in a single row, one parent leading, the other bringing up the string of young from the rear. The adults swam with necks outstretched and laid them flat on the water. From the distance of the observer they looked like a floating stick and would never impress the casual eye as a family of Canada Geese.

This behaviour was evidently successful in making the goose family inconspicuous. My observation, on the other hand, shows the limitations of instinctive behaviour; the strenuous underwater exertions by the leading goose (whatever its sex) were annulled by the rear adult which swam most conspicuously.

During the same weekend I came across another instance of inappropriate instinctive behaviour. Beavers which had recently reinvaded the cattail marsh on my acreage had not only added fresh mud to the dam at the outlet of the pond but had done the same at the only inflow of water form an adjacent smaller pond.

[1] BENT, A.C. 1925. Life histories of North American wild fowl, Part two. Smithsonian Inst., U.S. Natl. Mus. Bull. 126. Dover Reprint, N.Y. 1962.

Goslings at nest *R.E. Gehlert*

UNUSUAL CONCENTRATIONS OF SANDHILL CRANES DURING THE BREEDING SEASON

W.H. KOONZ, Manitoba Department of Natural Resources, Box 14, 1495 St. James Street, Winnipeg, Manitoba. R3H 0W9

On 14 and 15 June 1989, Blair McMahon and I observed large numbers of adult Sandhill Cranes feeding in a recently germinated grain field on the west side of PTH #276 near Waterhen (51° 47'N, 99°35'W). Starting in mid-afternoon on 14 June, cranes were noticed flying in from all directions. By 8:30 p.m., 86-90 cranes had assembled on the field. At 9:55 p.m. all but a handful of birds had flown away. The area was also checked on 15 June when at least 112 adult cranes were observed in the field at 6:30 p.m. Sandhill Cranes typically aggregate in early morning and late afternoon feeding flocks during spring, fall and winter, but I could not find reference to adults concentrated into feeding areas during the breeding season.[1] It may be that these birds were non-breeders spending the breeding season in the Westlake area. Non-breeding concentrations of Canada Geese are known to use traditional feeding areas, but this phenomenon has not been reported for Sandhill Cranes.

The observations seemed out of the ordinary given that young cranes should have been with their parents at that time of the year. Dry conditions and massive local fires likely contributed to poor 1989 Sandhill Crane productivity in Manitoba's Interlake, Westlake and boreal forest areas.

[1] STEPHEN, W.J.D. 1967. Bionomics of the Sandhill Crane. Can. Wildl. Serv. Rept. No. 2. 48 pp.

Sandhill Crane *Larry Morgotch*

ROSS' GULL NEAR SASKATOON, SASKATCHEWAN

JIM WEDGWOOD, 610 Leslie Avenue, Saskatoon, Saskatchewan. S7H 2Z2

My birding highlight in 1989 was on 24 October when a Pileated Woodpecker, a Clark's Grebe and a Ross' Gull, all Saskatoon area rarities, were seen. Always-hoped-for conditions prevailed each time: light from behind the observer, bird sufficiently close for good viewing and staying long enough for adequate study. Need to assure myself of the gull's identity was fillip for further inquiry on it.

About 7:30, shortly after sunrise under broken overcast, I was scanning the valley from a 5-m high bank on the east side of the South Saskatchewan River some 18 km south of Saskatoon. Immediately catching my eye was a small pink gull associated with a few Ring-billed Gulls milling over a stretch of channels, backwaters and sandbars.

The visitor was studied for 15 minutes (20x scope, 7.5x binoculars). Ranging from 100 to 300 m distant, it flew back and forth over a 200 m stretch of the river. Continuously in flight, the gull wheeled, banked, towered and swooped, occasionally hovering with tail spread. Seemingly scanning the water, at times it appeared to feed from the surface. These manoeuvers yielded excellent views of the bird.

Following initial observation of the visitor, a field guide was scrutinized, turned first to Ross' Gull, then leafed through for other possible gull candidates.[12] Ross' it seemed to be, but there were several differences between bird seen and bird illustrated. Basic field marks and variances were rechecked and noted, and the unusual underwing pattern was sketched — after the pink body, it was the most prominent feature. Characteristics of winter-plumaged Franklin's, Bonaparte's and Sabine's gulls — even Red-legged Kittiwake — were looked for, especially the light bill, head and wings, but these species were dismissed as possibilities. Because of changing light conditions, nearby Ring-billeds were compared to ensure the pink color was not sun-glow. But I left, puzzled by an obvious Ross' Gull with features differing from or not covered by the guide.

Observation Details

The bird was a small white-headed, white-tailed gull with salmon-pink body and pink underwing. Decidedly smaller than a Ring-billed Gull, in size and flight it was reminiscent of Bonaparte's Gull (of which many were still in the district). Bill was light, no rings, spots or two-tones (specifically rechecked), proportionately shorter than Ring-billed's. The head was white, with no trace of cap, no graying or streaking on pate, no ear patch or trace of neck ring, no pink wash, with dark eye. Breast was deep salmon-pink (a much stronger color than a mere wash; considerably deeper and more extensive than on spring Franklin's Gulls). Flanks were light grayed-pink, under parts pink, plain, with no streaks, bars or banding. Upperparts were light blue-grey, plain. The tail was white, with no pink wash, no streaks, bars or banding, its end rounded. Upperwings were light blue-grey over most of surface. Trailing edge of the wing was white from root to beyond the carpal joint; the white was wide, prominent. Outer forewing showed black from tip almost to carpal joint; the line of demarcation between black area and light blue-grey area was straight, at a highly acute angle with axis of wing The black patch was shaped like that on a Sabine's Gull

— a long, narrow triangle with its tip at the wrist and extending to the wingtip — though taking up less of the outer wing than on that bird); two small unequal-sized "mirrors" occurred near the tip of black primaries. Underwings were pink, except for the white trailing edge and black outer forewing patch; pink on axillaries was almost as deep as on breast, pink beyond axillaries was lighter and grayed.

Discussion

Identification was incomplete because pocket guides inherently have space only for normal field marks. The guide with me that day showed only two of the five Ross' Gull plumages — the wrong two.[12] Later recourse to references, including a specialized work on gulls, provided needed information on plumage details, ranges in characteristics and seldom-encountered variations.[7]

Normally in autumn, Ross' Gull undergoes a complete moult out of the first summer plumage. Moulting commences with inner primary feathers and terminates with the outer ones, all other feathers being replaced between these two events.[7] The Saskatoon bird's field marks appeared to fit this pattern of a Ross' Gull moulting into adult winter plumage.[8] The absence of dark tips on the inner primaries implied moulting had started, winter adults not having such tips. Continued presence of black outer primaries indicated moulting was incomplete — they formed the prominent dark patch on the outer forewing, feathers yet to be replaced by their light winter counterparts.[8] Similarly, only the outer half of the dark broad "W" on the upper wing of first summer birds was present, the inner legs (carpal bars) of the W being absent, their constituent feathers having moulted (or faded).[7] Apparently the moult of head feathers was also incomplete: the black neck ring characteristic of a first summer but not an adult winter bird was not seen; yet, the dark patch, which adults show behind the eye in winter, was still to appear.

Present on the tail were neither the slight extensions of the two central feathers on Ross' in all plumages, nor the dark terminal band of the pristine first summer plumage. These protrusions are sometimes broken off or worn to points, and the black band can be faded or worn.[7] Thus, moulting of tail feathers appeared not to have started, and the condition seen was due to wear and fading. Heavy feather wear was thought to have transformed the tail from a wedge to the rounded shape observed, although this was not confirmed in the literature then at hand.

Of eight guides and references, only in Grant was it noted that a pinkish color may be present on the underwing of some birds.[7] According to him, the pink on this and certain other gulls is reported to be a colorant in the preening oil. The color intensity, which is highly variable, is thought to depend on species, age, condition, season and diet. Pink tones show better on nearby birds and under overcast — the circumstances with the Saskatoon bird. The pink seen on the breast was much deeper than shown in three field guides (Farrand, Peterson and Scott), but was of about the same intensity as Robbins depicts (assuming consistency of color in runs and editions).[4 11 13 12]

Thus, observed field marks appeared to reconcile with known characteristics of Ross' Gull — aside from the tail and excepting just the bill (without exception all the references give its color as black). Do, in fact, some first-summer birds follow the deduced moult and wear sequence, and in October exhibit the field marks observed? Available references do not address all aspects of plumage transitions, and the question was referred to the National Museum. In reply, Henri Ouellet, Curator of Ornithology, while noting points in question, concluded that there

is a very high probability the bird is a Ross' Gull. His points were: pattern of black on wings (question likely due to a fault in my description, since corrected), color of legs (which I had not given), color of back, color of bill and shape of tail (pers. corr.).

A back color of light blue-gray, as observed, is not agreed by all authorities: soft blue-gray (Cramp), gray (Godfrey), pale gray (Grant) and pearl-gray (Harrison).[3 6 7 8] At this remove, clarification is impossible. Color of the bill remains an enigma.

Tail shape is crucial. In eight guides and references a wedge shape is noted as a diagnostic field mark for Ross' Gull. As remarked, no confirmation had been found for an assumption that feather wear sometimes results in a rounded end, that is, until the August, 1989, issue of *Birding* arrived in January, 1990. It had a photograph of an adult winter-plumaged (February) Ross' Gull in flight at close range.[10] And the much worn tail was rounded. A second photo, a flying adult taken close up (September), displayed less tail wear, yet enough to round off the mid-part of the tail.[9] These photos resolved the remaining critical point in an interesting identification poser. The "pink gull" was an aberrant in more ways than one: out of range, partly moulted, atypical bill color, tail uncommonly rounded and a deeper and more extensive pink coloration than usual.

Where did the gull come from? There are several small breeding colonies in the Western Hemisphere: Hudson Bay (Churchill, Manitoba), two or three islands in the Canadian Arctic, and Greenland.[2 7] The bulk of the scant population, however, breeds on the Siberian coast, from where numbers migrate eastward each autumn, biding on the Alaskan and Yukon north shore before returning to the Arctic Far East.[9 8] Ross' is thought to winter along the edge of the pack ice and in the northern seas.[8] As both breeding and wintering ranges are in the high north, this truly Arctic species is seen but rarely in the temperate zone.[7]

Ross' Gull is on the rare and endangered species list for Canada.[1] Godfrey did not record it for Saskatchewan,[6] and neither the Saskatchewan Museum of Natural History (P.C. James, pers. corr.), nor the Saskatchewan Bird Atlas (A.R. Smith, Canadian Wildlife Service, pers. comm.) has any report of it. A hypothetical entry on the Saskatoon Area bird checklist is a record of mine, also of a fall visitor, in 1986, a bird which flew low overhead and was seen for only a few seconds.[5] The 1989 sighting was a much superior — and a more challenging — observation of a Ross' Gull, the first one written up for the province.

Acknowledgements

I am grateful to Henri Ouellet for examining the Museums's specimen collection and commenting on my observation report, and to Bernie Gollop for assistance with references.

[1] COMMITTEE ON THE STATUS OF ENDANGERED WILDLIFE IN CANADA. 1989. List of species with designated status. COSEWIC. 2 pp.

[2] COPLAND, H. *et al.* 1986. Field checklist of the birds of Manitoba. Manitoba Avian Research Committee. 14 pp.

[3] CRAMP, S. 1983. Birds of the western palearctic. Oxford Univ. Press. 913 pp.

[4] FARRAND, J.A. (editor) 1983. The Audubon Society master guide to birding. 3 vol. Knopf, N.Y. 447, 398, 399 pp.

[5] GILLILAND, M. and J.B. GOLLOP. 1987. Saskatoon area birds: a seasonal checklist. Saskatoon Natural History Society, Saskatoon. 8 pp.

[6] GODFREY, W.E. 1986. The birds of Canada. National Museums of Canada, Ottawa. 595 pp.

[7] GRANT, P.J. 1986. Gulls: a guide to identification. T. & A.D. Poyser, Calton, UK. 352 pp.

[8] HARRISON, P. 1983. Seabirds: an identification guide. Houghton Mifflin. 448 pp.

[9] MAYNARD, W.R. 1989. Jewels of the north. *Birding* 31:200-204.

[10] O'BRIEN, R. 1989. Photograph, adult Ross' Gull. *Birding* 31(4):cover.

[11] PETERSON, R.T. 1980. A field guide to the birds of eastern and central North America. Houghton Mifflin, Boston. 384 pp.

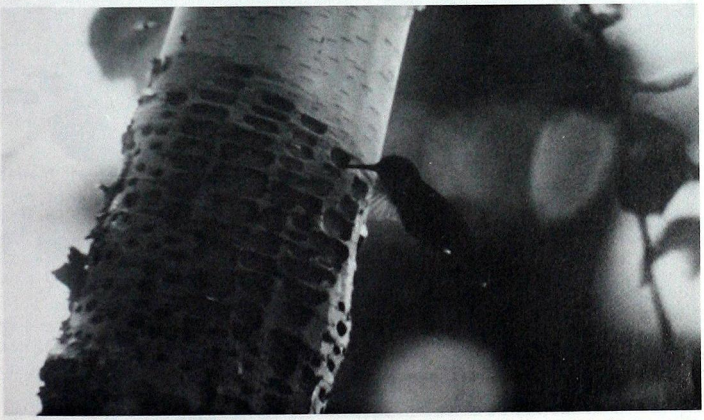
[12] ROBBINS, C.S. B. BRUUN, and H.S. ZIM 1966. A guide to field identification: birds of North America. Golden Press, New York. 340 pp.

[13] SCOTT, S.L. (editor) 1983. Field guide to the birds of North America. National Geog. Soc., Washington, D.C. 464 pp.

INFORMATION REQUEST -- SAPSUCKER vs HUMMINGBIRD

Richard Miller, author of an article on sapsucker - hummingbird relationships [MILLER, R.S. and R.W. NERO. 1983. Hummingbird - sapsucker associations in northern climates. *Can. J. Zool.* 61:1540-1546.], is seeking information relative to these two species for further analysis. He is looking for long-term migration data, specifically spring arrival dates and fall departure dates for both sexes of Ruby-throated Hummingbirds and Yellow-bellied Sapsuckers. Send information you may have to :

Richard S. Miller
35 Linsley Road
North Branford, Connecticut, U.S.A.
06471



Ruby-throated Hummingbird feeding at sapsucker drills *Anonymous*

PREDATION AT BANK SWALLOW COLONIES NEAR KATEPWA LAKE

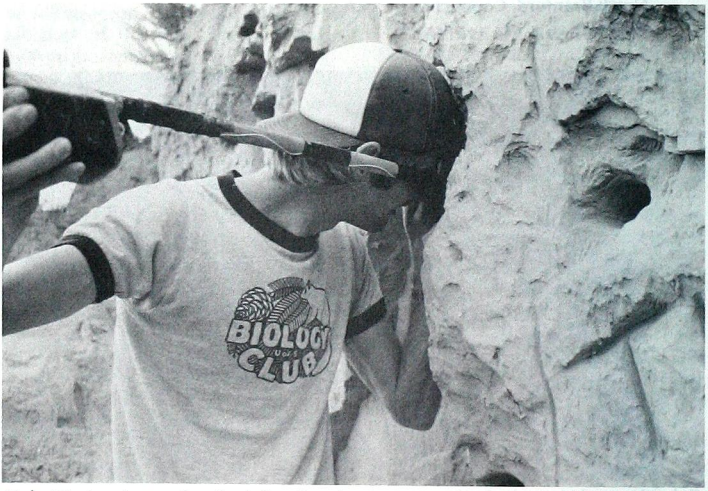
DALE G.HJERTAAS and PAULE HJERTAAS, 15 Olson Place, Regina, Saskatchewan. S4S 2J6

During 1980 and 1981, we studied Bank Swallow colonies along the Qu'-Appelle Valley in the area of Katepwa Lake for the senior author's M. Sc. research.[4] Several cases of predation observed at these Bank Swallow colonies are reported here.

We made repeat observations at 498 nests and recorded 183 known nest failures during 1980 and 1981. Only 9 of these failures were directly attributable to predation. Additional cases of predation were recorded in 1982 in the same area.

The most exciting predator-prey interaction observed was on 13 July 1980, at approximately 6:30 p.m. While driving through Lebret Dale glanced at a Bank Swallow colony at the edge of town. He saw a Bank Swallow fluttering in front of its hole, his impression was that it was struggling as though caught with a string around its foot. Thinking the bird may have become entangled in an unusually long piece of nesting material, we turned the car around at the next intersection and drove back to the colony. At first we saw nothing and almost concluded the bird was gone when we noticed a garter snake holding a struggling Bank Swallow at the bank base.

The snake was in and around some Russian Thistle on the talus slope below the nest holes. It held the swallow just



Dale Hjertaas inspecting Bank Swallow burrow

Western Plains Garter Snake with Bank Swallow

behind the wing and appeared to be trying to slowly shift its grip until it could swallow the bird from the front or back. This process was hampered by the swallow's struggles and by the wings. The Bank Swallow, which appeared to be an adult, rested quietly some of the time, then would struggle, flapping its wings and lifting the snake's head several inches off the ground.

When we returned between 8:00 and 8:30 p.m. they were at the same place. The snake had shifted its grip and was trying to swallow the bird tail first, having engulfed it up to the wings.

This case of predation did not cause a nest failure as young were already flying from all nests at the colony, although a few Bank Swallows were still returning to nest tunnels.

The ten nest holes at this colony were from 1.3 to 1.75 m above the talus slope and between 0.75 and 1.5 m from the

bank top. We did not attempt to estimate the length of the Western Plains Garter Snake, but believe it was able to reach nest holes from the bank top. We do not know whether it trapped a swallow which was already inside the tunnel, or waited in ambush for a returning swallow. When we drove by, the snake must have just caught the swallow and was struggling with it in the tunnel entrance. Freer observed a Black Snake enter a burrow from the top of the bank and visit three tunnels before taking a young swallow.[2] Black Rat Snakes have also been noted as predators at Bank Swallow colonies.[1,6] Mobbing by the Bank Swallows was an ineffectual defence against these snakes.[1,2] Steepness of the bank and an overhang at the bank top may prevent snakes from reaching the burrows.[1,2]

In 1981 a Deer Mouse nested in an old swallow tunnel in a gravel stock pile south of Lebret. Small ledges on the gravel face allowed the mouse to travel back and forth along the bank face and reach other swallow holes. The mouse appeared to eat the swallows' eggs as we observed bits of broken egg shells in failed swallow nests. Nine of the 16 nests at this colony failed due to the mouse eating eggs. Four other nests failed for reasons which remain unknown because we could not see into the nest chamber. The Deer Mouse may have been involved in these nest failures as well. The only nest of 16 which fledged young at this colony was the farthest nest from the hole occupied by the deer mouse.

Stoner reported a Deer Mouse in a Bank Swallow colony but could see no evidence of the mouse having damaged eggs or young.[7] These mice have been reported as a major predator of Spotted Sandpiper eggs.[5]

Bank Swallows have been reported to mob mammalian predators such as chipmunks which sometimes prey on nestlings or eggs.[2,3] We never observed the Bank Swallows along the Qu'Appelle Valley use such mobbing tactics. On 13 June 1980 we watched both a Least Chipmunk and a Thirteen-lined Ground Squirrel at a colony. Both moved on the talus slope and on ledges on the actual nest bank without any interference by the swallows. The chipmunk actually looked into some of the burrows. Although the Bank Swallows took no action, a House Wren which was nesting in an unoccupied Bank Swallow tunnel attacked and chased the chipmunk from the bank face.

During 1980 and 1981 we observed no evidence of predation by large mammals which we had thought would be a major factor influencing where Bank Swallows nested. However in 1982, 28 of 30 nests at one gravel pit complex and 1 of 8 at a second pit, approximately 2 km away, were dug out by a mammal which excavated down to the nest chamber from above. Perhaps it could hear or smell the nestlings or adults as holes were excavated directly to the chamber and nest contents scooped out through a small opening. Bits of egg shell at some nests suggested they were still at egg stage, while others clearly contained young when preyed upon between 11 and 21 July.

Holes dug by mammalian predators

The species of predator could not be identified with certainty as recent rains had eliminated tracks before each of our visits. However, size of the holes (they were 15 to 18 cm wide at the top, and funnel shaped with only a small opening to the nest chamber), and some scats suggested a larger mammal such as a skunk, fox or badger was the predator. Stoner reported a Striped Skunk digging down to as many as five nests over a 2-night period.[7] Nests lower than 60 cm were usually safe from this skunk. Freer observed a colony of 30 nests entirely destroyed by a mammal digging down from above.[2]

Interestingly, at the colony where only one nest was excavated, it was the one closest to the surface. Tunnel entrances of nests preyed on by this mammal ranged from 11 to 42 cm below the bank top. The distance from the ground surface to the nest chamber was not recorded.

Predation at Bank Swallow colonies in the Qu'Appelle Valley was a minor source of nest failure in 1980 and 1981. However, as shown by the almost total failure of one colony in 1982, predation can have a significant impact in some cases and is undoubtedly a strong selective force in determining the types of banks selected by Bank Swallows.

1 BLEM, C.R. 1979. Predation of Black Rat Snakes on a Bank Swallow colony. *Wilson Bull.* 91:135-37.

2 FREER, V.M. 1977. Colon structure and function in the Bank Swallow *Riparia riparia* L. Ph. D. dissertation, State Univ. New York, Binghampton, N.Y.

3 GINEVAN, M.E. 1971. Chipmunk predation on Bank Swallows. *Wilson Bull.* 83:102.

4 HJERTAAS, D.G. 1984. Colony site selection in Bank Swallows. M. Sc. Thesis, Univ. of Sask., Saskatoon, Sask.

5 ORING, L.W., D.B. LANK and S.J. MAXSON. 1983. Population studies of the polyandrous Spotted Sandpiper. *Auk* 100:272-285.

6 PLUMMER, M.V. 1977. Predation by Black Rat Snakes in Bank Swallow colonies. *Southwest Naturalist* 22:147-148.

7 STONER, D. 1936. Studies on the Bank Swallow *Riparia riparia* (Linnaeus) in the Oneida Lake Region. *Roosevelt Wildl. Annals* 4:127-233.

Bank Swallow feeding young at burrow entrance

MOCKINGBIRD NEAR SYLVAN LAKE, ALBERTA

On 19 March 1990 I heard a bird singing many beautiful but different songs. I tried to walk closer, but the crusty snow made a big noise and I could not get near the bird without scaring it away.

Three days later a neighbor lady asked me if I could identify a bird she had seen lately. She described it as being grey, with a long tail and black markings on its wings when it flew. She said it sang beautifully and seemed to be singing other bird songs also. I thought to myself this bird must be a mockingbird, so I looked it up in my *Field guide to birds of North America*. Still I wasn't sure if it was a mockingbird because it is a bird of the southern half of the U.S.A.

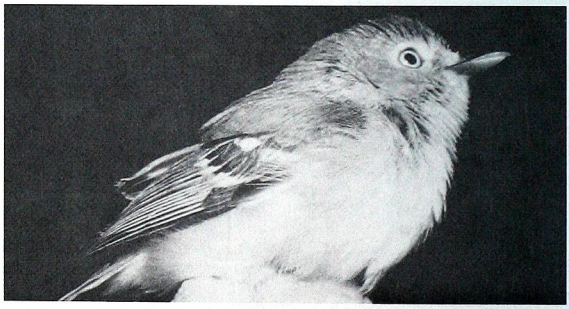
On 28 March the bird was back on a tall aspen poplar. I had a good look at it through my field glasses. It wagged its tail from side to side while perched on the branch. The tail seemed almost to be the length of its body. When it flew, its wing beats were so slow that they could be counted and it showed white wing patches. It somewhat resembled a shrike, but was lacking the hooked bill; also the shrike's bill is short and thick. The next evening I heard the bird singing musical notes and saw it in flight.

This is the first sighting of the Northern Mockingbird in this area for me, though I have lived here 68 years. The description in my field guide gave the same version as I observed when I studied the bird through my field glasses. — *Helge S. Abrahamson*, Box 268, Sylvan Lake, Alberta. T0M 1Z0

FURTHER TO WHITE-EYED VIREO OBSERVATIONS

While reading the December 1989 issue of Blue Jay, the article "White-eyed Vireo in Regina — first for Saskatchewan" by Frank H. Brazier [Blue Jay 47(4):216] caught my eye. He mentioned a white-eye banded in South Dakota on 20 May 1982. I knew that my parents, Charles and Gladyce Rogge (Permit #9089), had banded this species, so I checked with them and found that they had indeed banded a White-eyed Vireo in Newton Hills State Park, South Dakota on that date. They photographed the bird, a rare record for South Dakota, at the time of banding.

— *Janet Rogge Dugle*, Box 299, Pinawa, Manitoba. R0E 1L0



White-eyed Vireo, Newton Hills State Park, South Dakota, 20 May 1982
Charles and Gladyce Rogge

HOUSE FINCH AT REGINA, SASKATCHEWAN

The following notes were taken on House Finch observations in Regina, Saskatchewan.

Date: 23 April 1990

Place: Back yard feeder, 40 Richardson Crescent, Regina, Saskatchewan

Time: 10:30 a.m.

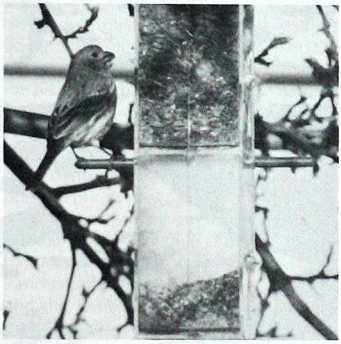
Description: Small bird, size of sparrow, slightly slimmer, brownish in color, streaked breast. No markings on head. Thick bill.

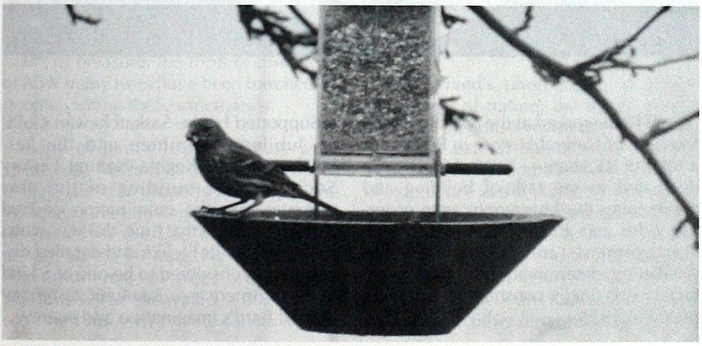
Feeding habits: Fed on sunflower seeds rather than bird seed. Never seen on ground. Always at feeder or in tree, not intimidated by sparrows.

Sightings: 23 April 1990, 10:30 a.m., 5:00 - 5:30 p.m. 24 April 1990, 7:30 a.m. Not seen again.

Photos (slides): Ektachrome 200 lens zoom 70-230. Photo taken at 230 at a distance of about 12 feet.

— *Keith Barr*, 40 Richardson Crescent, Regina, Saskatchewan. S4S 4J3





IN MEMORIAM — DR. FREDERICK GEORGE BARD — 1908 - 1989

RUBY APPERLEY and FRED LAHRMAN

Fred Bard worked at the Saskatchewan Museum of Natural History in Regina for a total of 45 years — years which were dedicated to the task of building and maintaining the Museum.In spite of terrific odds and great difficulties and discouragement, and because of this unfaltering determination, a permanent facility was finally constructed and completed in 1955.

Supported by the Saskatchewan Golden Jubilee Committee and the Saskatchewan and Regina Natural History Societies, the building of the new museum was the culmination of Fred Bard's dream. At that time, this renowned building with its lifelike and detailed displays was considered to be one of a kind in north America — a graphic testimony to Fred Bard's imagination and energy.

Years later Dr. Stuart Houston commented in his wildlife column in the quarterly Fish and Game Sportsman: "I remember Fred showing me through the new building on Easter Weekend 1955. The plastering wasn't done, wires dangled and exhibits were just holes in the wall. Familiar with habitat exhibits in large American museums, where one case takes over one year and $10,000.00 to prepare, I expected that at most one habitat case would be ready when the Governor General opened the museum on May 16. Imagine my surprise at the opening ceremonies to find the Museum completed. Ably assisted by Fred Lahrman and R. D. Symons and by working night and day these men had achieved the impossible."

From his early youth Fred Bard loved the outdoors and the world of nature. He wanted to share with others the wonders he found there. When he was 16, the Museum of Natural History became a natural outlet for him to achieve his goal of popularizing nature. Perhaps it is not generally known that he also dreamed of a museum out-of-doors, one where people could enjoy and study the living world of nature in the wild. To this end, he was instrumental in establishing the Wascana Waterfowl Park, the Condie Nature Refuge, as well as many Interpretive Centres and Nature Trails within the provincial parks system.

Who can ever know the countless hours of pleasure, the thrill of discovery, or how many lives have been touched by people visiting these sanctuaries.

Many of Bard's happiest hours were spent with his family on a small, open, treeless piece of property fronting on the Wascana Creek in Regina, which he had purchased in the late thirties. It didn't remain barren for long. He soon planted row upon row of trees which grew vigorously. He excavated a dugout and soon had his own private sanctuary. He called this area the "banding station" — for it was there that he first banded waterfowl and began his prestigious bird banding career. Thus over the years Fred Bard won recognition in North America as an ornithologist.

Bard delighted in listening to the songs of the Yellow-headed Blackbirds, Marsh Wrens and other birds which filled the air with their melodies in early spring and summer while he worked in his garden at the "banding station." It was here that the Wascana Canada goose flock was started. The flock began modestly in 1953 with the first pair of geese — "Hiawatha and Queenie" — a gift from the late Ralph Stueck, a naturalist from Abernethy, Saskatchewan. It took additional pairs of geese, eggs, hard work and a good measure of trial and error before the geese became established. The many Canada Geese now found in the southern part of the province and especially Regina, attest to the success of this pilot project.

At the "banding station" Fred Bard did some of his first film work. He spent many hours in blinds photographing birds in the marsh, becoming an accomplished photographer — both in stills and motion pictures. His beautiful photos appeared in various publications throughout Canada and the United States. He assembled a portfolio of coloured slides to meet the demand for his lectures, which he delivered to many city and rural schools in the province.

While Fred's photography portrayed the beauty of nature, the theme always centered on conservation and the preservation of natural habitat. His film *The Pelicans of Last Mountain* won an award of excellence at the Yorkton Film Festival in the early 1950s. He filmed a variety of subjects including the Carrot River Log Drive, paleontology and archaeology excavations and of course his first love, zoology. Much of this footage was incorporated into other film productions.

Early in his career Fred became involved with the conservation of the nearly extinct Whooping Crane. In the mid 1940s he assisted others in the search for the then unknown nesting area of these magnificent birds. Although many miles were flown over northern Saskatchewan, no nests were found. It was not until about 1945 that he saw his first Whooping Crane. There is a tale of his delight and amazement when he saw the almost mythical bird and shouted "It really is a Whooping Crane."

Through publicity campaigns, the public rallied in support of the birds and reports began coming in of other Whooping Crane sightings. It was through these reports that Fred and other museum staff were able to film the cranes, and no doubt this publicity helped to bring the Whooping Crane back from the brink of extinction. It was Fred who first conceived of the idea for a Whooping Crane foster parent experiment using Sandhill Cranes to raise Whooper chicks. Some 20 years later, in 1975, the experiment was finally tested.

Fred Bradshaw, Director of the Provincial Museum since 1928, and his staff at the museum were undoubtedly the catalysts in the move to organize the Regina Natural History Society founded in 1933; many of the preliminary discussions took place in the work room of Bradshaw's assistant, Fred Bard. The Regina Society and the Provincial Museum have remained mutually supportive.

When Fred was appointed director of the Provincial Museum in 1947 he promised to assist the *Blue Jay*, which was in difficulties after Isabel Priestly's death, by mimeographing the bulletin at the museum. He also reported regularly to the *Blue Jay* on museum activities. When an organization meeting was called in Regina to form the Saskatchewan Natural History Society on 24 January 1949, Fred Bard was one of the founding members. He was one of it first directors (although he preferred not to take an office), and honorary president for some time. In the early years, Bard was an active member of both the provincial and local societies.

Fred Bard was a founding board member of the Saskatchewan Museums Association and continued his support throughout the years, always willing to assist the smaller museums of the province.

On 31 May 1970, Fred retired from the Saskatchewan Museum of Natural History, where he had served so diligently for 45 years, the last 23 as director. Just prior to his retirement he was awarded an honorary Doctor of Laws degree by the University of Saskatchewan, Regina Campus, in recognition of his notable contributions to the province in developing the Museum and for his work in conservation. In addition, he received numerous other awards for his dedicated services to conservation.

After his retirement from the Museum, Fred and Phyl Bard moved to Surrey, B.C., where nature conservation and the promotion of natural history continued to play an important role in Fred's life. He spent many hours working on a local Ducks Unlimited project, where he had the opportunity of working with his beloved Canada Geese.

On 23 September 1989, at the age of 81, Frederick George Bard passed away after a lengthy battle with cancer. He is survived by his wife of 53 years, Philomene, of Surrey, B.C., one son Donald of California, twin daughters Arlene Feltz of New Mexico and Lorene Freemen of Victoria, B.C.

Fred Bard's contribution to wildlife conservation and education will continue to enhance the lives of people for generations to come.

SASKATCHEWAN NATURAL HISTORY SOCIETY
BOX 4348, REGINA, SASKATCHEWAN S4P 3W6
(306) 780-9273

BLUE JAY BOOKSHOP
SUB P.O. 8, 1210 7th AVENUE N,
SASKATOON, SASKATCHEWAN S7K 2W2

Second Class mail registration Number 1046
Please return unclaimed copies.
Return postage guaranteed.

Box 4348, Regina, Saskatchewan.
S4P 3W6